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THE UTILITY OF DE-ESCALATORY CONFIDENCE-BUILDING MEASURES

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CONTENTS

Accession For
NTIS GRA&I ☑
DTIC TAB ☐
Unannounced ☐
Justification
By per letter
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

FIGURES

TABLES

I. INTRODUCTION

There has recently been a renewed emphasis on the establishment of confidence-building measures (CBMs).[1] Most CBMs highlight intentions and thus stand in contrast to traditional or "structural" arms control which generally seeks quantitative limits on forces. Recently concluded CBMs include the establishment of crisis control centers in Washington and Moscow and the 1986 Stockholm Agreement on Confidence- and Security-Building Measures.

Most established CBMs increase the exchange of information between potential adversaries, while only a few restrict military operations. Information-based CBMs include the 1963 "Hotline" Agreement and the establishment of crisis centers in Washington and Moscow. These measures are intended to decrease the likelihood of misunderstanding and unintended conflict.

CBMs which restrict military operations highlight intentions, but are also intended to restrict an aggressor's range of military options. These restrictions serve a number of objectives, including decreasing the likelihood of accidental conflict and decreasing surprise attack incentives. SALT I and II and the 1972 Agreement on the Prevention of Incidents On and Over the High Seas include CBMs which restrict military operations. SALT Treaties banned interference with national technical means (NTM) of data collection; the High Seas Agreement designed specific procedures for U.S. and Soviet naval combatants intended to reduce harassment and simulated attacks. The Soviet Union has regularly proposed operational restrictions on strategic bomber, nuclear submarine, and nuclear aircraft carrier operations.[2]

De-escalatory strategic force CBMs, particularly those which restrict military operations, may be useful in superpower crisis management. For example, consider a U.S.-Soviet nuclear crisis in which a peaceful resolution appears likely. Despite this positive indicator, the United States and Soviets might remain reluctant to take additional de-escalatory steps. De-escalatory measures, particularly those involving strategic forces, may build confidence and contribute to crisis termination.

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[1] See "Confidence-building measures receiving increased attention," *Jane's NATO Report*, Vol. 4, No. 10, November 11, 1988, p. 2 for recent developments.

[2] Raymond Garthoff, "The Accidents Measures Agreement," in John Borawski, ed., *Avoiding War in the Nuclear Age: Confidence-Building Measures for Crisis Stability*, (Boulder: Westview Press, 1986), p. 61.

This paper evaluates the potential utility of several de-escalatory strategic force CBMs. It focuses on, but is not limited to, an evaluation of the utility of operational restrictions on strategic nuclear forces. The evaluation of potential de-escalatory measures is complicated—de-escalation carries uncertain costs, including increased force vulnerability, and provides benefits, including a decreased perceived threat of enemy attack. This paper generates a list of potential strategic force de-escalatory CBMs and evaluates their costs and benefits based on national and crisis objectives.

The paper uses the following approach. First, it examines changes in United States and Soviet military operations in a peacetime to crisis transition, outlines the military, psychological, and political threats inherent in nuclear alerts, and describes the role of CBMs in decreasing these threats. Second, it generates a list of potential de-escalatory strategic force confidence-building measures. This focuses on a return to normal military operations. Third, it defines CBM objectives and evaluates the costs and benefits of each potential CBM.

The paper offers several conclusions. First, several de-escalatory measures, including those involving integrated force operations, may be useful in building confidence in a crisis. Potentially useful measures include the phased return of strategic aircraft and submarines to main bases or ports, respectively, the termination of interference with communications and national technical means of data collection, and the termination of civil defense preparations. Second, asymmetries between United States and Soviet forces limit the utility of many potential CBMs. For example, CBMs which restrict strategic bomber operations impose high cost on the United States and relatively low costs on the Soviets. Third, the utility of many CBMs appears unlikely to appreciably change under the START framework, although the reduced number of strategic platforms under START may result in fewer potential nuclear force CBMs.

The paper is structured as follows. The second section summarizes CBM objectives, limitations, and existing confidence-building measures. The third section outlines the threatening nature of nuclear alerts and the role of CBMs in decreasing these threats. The fourth section describes changes in United States and Soviet operations in nuclear alerts. The fifth section generates a list of potential de-escalatory confidence-building measures and evaluates their costs and benefits. The sixth section examines the potential utility of CBMs in a future context. The final section summarizes the utility of de-escalatory strategic force measures, suggests a de-escalatory ladder, and discusses the origins and form of de-escalatory strategic force CBMs.

II. CONFIDENCE-BUILDING MEASURES

CBM OBJECTIVES AND LIMITATIONS

Most confidence-building measures are intended to influence perceptions between potential adversaries. In particular, CBMs highlight intentions. This may be particularly important in a superpower crisis when mutual mistrust is high. Some CBMs also reduce the potential for accidental conflict, complicate war plans, and decrease surprise attack incentives.

Most CBMs, including information exchange and observation and inspection of military activities, provide adversaries with important information about opposing military forces. In particular, information-based CBMs provide important information about ambiguous or surreptitious military actions. Declaratory policies, such as a no-first-use pledge, are also intended to provide valuable insight into intentions. Declaratory policies can be valuable in highlighting intentions, particularly when accompanied by appropriate military measures. Declaratory policies may also constrain some military options. For example, an antagonist who violates his own declaratory pledge provides information about the value of future pledges. This consideration, along with the political leadership's possible adherence to "rules of the game," may permit declaratory policies to reduce an aggressor's range of military options.

CBMs are also intended to reduce the potential for accidental conflict. Restrictions on military operations, for example, may decrease aggregate military activities and the potential interaction between adversaries. In addition, CBMs may reduce the likelihood of war by reducing the incentives for a surprise attack. For example, operational restrictions on stealth bombers (or stealth cruise missile carrying bombers and submarines) or submarines near opposing command centers may complicate plans for a surprise attack and thus reduce an aggressor's incentives to attack.

However, the utility of many CBMs may be limited.[1] For example, CBMs probably contribute little, if any, to a situation in which the vital interests of two strong-willed adversaries are in direct conflict. Moreover, some CBMs may actually increase attack incentives and the probability of war if antagonists agree to their establishment

[1]For a historical overview, see Kevin N. Lewis and Mark A. Lorell, *The Utility of Confidence-Building Measures in Crisis Situations: Some Case Studies*, The RAND Corporation, P-6947, 1984, pp. 6–8, 28–30.

with the intent of deliberately engaging in deception. In short, many CBMs may reduce the potential for accidental superpower conflict; however, their utility may be limited when vital interests are at stake.[2]

EXISTING CBMS

Four categories of confidence-building measures exist: information exchange, declaratory policies, observation and inspection of military facilities and activities, and restrictions on military operations. A majority of established CBMs fall into the first category. De-escalatory strategic force measures, the subject of this paper, fall in the last category. Figure 1 represents a diagrammatic overview of arms control and CBM categories.

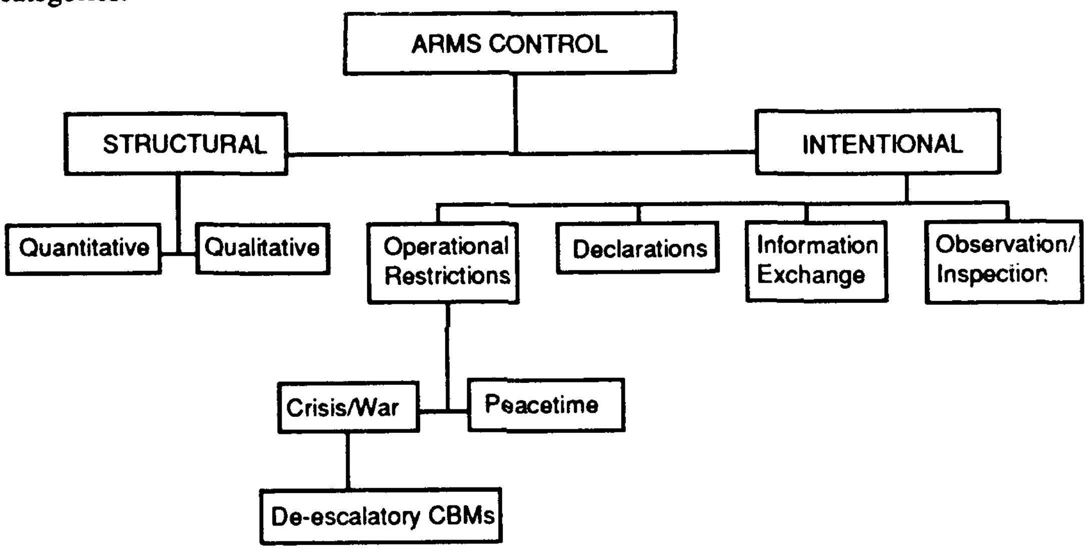

Fig. 1—Diagrammatic overview of arms control categories

Information Exchange

Most CBMs focus on information exchange. Several measures, including improved communications facilities, crisis management centers, and prior notification of military activities facilitate information exchange and may decrease the potential for

[2]This brief discussion does not do justice in assessing the utility of CBMs in preventing intentional versus accidental war. CBMs contribute perhaps the greatest in decreasing the likelihood of accidental war; however, some CBMs, operational restrictions in particular, may reduce the likelihood of intentional conflict by reducing surprise attack incentives. For example, keep-out zones for Soviet SSBNs may reduce the likelihood of a successful Soviet decapitating strike against the U.S. National Command Authority (NCA) and reduce the likelihood of war.

accidental war. Information exchange increases the transparency of military activities and allows antagonists to better distinguish threatening from benign activities.

The most prominent information exchange CBM is the U.S.-Soviet data communications link (DCL), commonly referred to as the "Hotline." The Hotline permits the rapid exchange of information between U.S. and Soviet leaders, and now has a facsimile transmission capability of more than 200 words per minute, as well as the capability to transmit graphic materials.[3]

U.S. and Soviet staffed crisis centers provide a second avenue for improved information exchange. The impetus for a September 1987 agreement establishing these centers originated from a 1984 U.S. Senate Resolution. The Resolution recommended the centers' establishment to provide discussions on incidents of nuclear terrorism, nuclear proliferation, military doctrine, and superpower crises. The centers appear only to provide an additional avenue for the sharing of data and the notification of ballistic missile launches. As such, the agreement seems to fall far short of the Senate authors' objectives.

Finally, information exchange in the form of prior notification of military activities may serve as a useful CBM.[4] Most measures focus on conventional forces, although both the United States and the Soviets recently agreed to notification schemes involving ballistic missile launches.[5]

Information exchange faces several potentially serious limitations in crises. First, the Hotline and other forms of information exchange may be used to exchange misleading or false (but difficult to verify) information. For example, crisis center

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[3]Sally K. Horn, "The Hotline," in John Borawski, ed., *Avoiding War in the Nuclear Age: Confidence-Building Measures for Crisis Stability*, (Boulder: Westview Press, 1986), pp. 52-53. NATO representatives also proposed the establishment of a European hotline at the Conference on Confidence- and Security-Building Measures and Disarmament, although no such measure was included in the final Conference document.

[4]The 1971 Accidents Treaty (formally known as the "Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War Between the United States of America and the Union of Soviet Socialist Republics") provided for each party to "notify each other immediately" in the event of an accidental, unauthorized, or unexplained nuclear detonation. SALT II similarly required the United States and the Soviet Union to notify each other "well in advance" of ICBM launches beyond national territory. Confidence- and Security-Building Conferences in Helsinki and Stockholm have established elaborate procedures for the advance notification of potentially ambiguous military activities. The Document of the Stockholm Conference requires a minimum notification of 42 days for land maneuvers involving more than 13,000 troops, 300 tanks, or 200 aircraft sorties or amphibious landings or parachute drops involving more than 3,000 troops. See Document of the Stockholm Conference, Paragraphs 31.1.1, 31.1.2, 31.2.1.

[5]"Confidence-building measures receiving increased attention," *Jane's NATO Report*, Vol. 4, No. 10, November 11, 1988, p. 2.

personnel may be deliberately given inaccurate information.[6] Similarly, prior notification of military activities may not necessarily add significantly to insight about enemy intentions. In some cases, notification of large-scale maneuvers may conceal belligerent intentions and decrease warning time.[7] Second, information exchanged or declarations issued through crisis centers may be misinterpreted. For example, biases may evolve based on personal relationships or the uncertainty involved in interpreting information. Third, the rapidly changing military and political situation may lead to unintended errors in exchanging data, exacerbating mistrust between crisis center personnel.

Declaratory Principles

Declaratory policies constitute a second CBM category, although the utility of declaratory CBMs is often hotly debated. In particular, many view declaratory statements with skepticism since declaratory principles are unenforceable and easily reversible.

The 1973 U.S.-Soviet Agreement on the Prevention of Nuclear War appears to be the only existing declaratory CBM. Article IV states only that the United States and Soviet Union agree to "immediately enter into urgent consultations" in times of crisis.[8]

The limitations of declaratory principles are obvious. Most importantly, declaratory principles are non-binding. Second, declaratory principles may promote false confidence, particularly if intended to deceive an opponent. Finally, declaratory principles are of questionable value in promoting confidence given the level of mistrust in a crisis.

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[6]Moscow may inform their Washington crisis center that recent troop movement in East Germany have occurred because of domestic unrest when the movements actually indicate the first stages of mobilization. Soviet crisis center personnel would likely argue vociferously with their American counterparts (possibly with some success) that the movement was benign. An analogous situation may have occurred early in the 1962 Cuban Missile Crisis when Soviet Ambassador Dobrynin denied the existence of Soviet missiles in Cuba.

[7]Consider the following situation. Tension has been increasing for several months between the United States and Soviets, particularly in Central Europe. In fact, the Soviet leadership views the "belligerent" U.S. response as tantamount to strategic warning. The Soviets plan an invasion, but realize that any unannounced mobilization will draw particular attention. The Soviets announce large-scale maneuvers in 45 days to conceal the invasion effort. It is possible that experienced military intelligence officers might distinguish maneuvers from invasion preparations, although this is somewhat uncertain. Moreover, the West might view the Soviet actions as less threatening since they were "playing by the rules."

[8]Article IV, "Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War."

Observation and Inspection

CBMs which allow the observation and inspection of military or ambiguous activities are designed to increase the transparency of military operations. This may allow potential adversaries to distinguish between threatening and benign military activities.

The Document of the Stockholm Conference and Articles 15 and 12 of SALT II and the ABM Treaties, respectively, provide examples of observation and inspection CBMs. The former requires participating states to invite observers from all other participating states to military activities with greater than a designated number of troops.[9] The Document provides for limited inspections on demand and has been highly praised as an arms control success. SALT II and ABM Treaties protect inspection and observation rights by restricting interference with National Technical Means of observation.

Observation and inspection may increase in importance in the future, particularly if on-site inspections become common. However, the utility of observation and inspection CBMs may by limited by two factors. First, the utility of these measures is highly dependent on the timeliness of inspections. In particular, less than timely inspection provisions may limit opportunities to detect non-compliance. Second, limitations in scope may decrease the utility of these measures. For example, CBMs which greatly restrict observers' access to military maneuvers may heighten rather than lower mistrust in crisis situations.[10]

Restrictions on Military Operations

Measures which restrict military operations are also intended to increase confidence about enemy intentions. However, these measures should accomplish two specific military objectives. First, restrictions on military operations are intended to complicate large-scale surprise attack plans and to reduce an aggressor's advantage following a surprise attack. For example, operational restrictions establishing specific nuclear force operational guidelines may limit damage to defending forces and decrease surprise attack incentives. Second, these measures should increase a defender's warning time if a large-scale surprise attack occurs. For example, a measure to remove armored

[9] Activities involving 17,000 troops or 5,000 in cases involving amphibious landings or parachute drops require states to invite observers.

[10] Restricting observers to relatively benign activities (such as vehicle maintenance) may heighten rather than lower suspicion of belligerent intentions.

forces from Central Europe likely complicates Soviet planning and increases warning time to Western intelligence should mobilization for an attack occur.[11]

One significant success in operational arms control is the 1972 Incidents at Sea Agreement. Article III states that parties may not "embarrass or endanger" or "simulate attacks" on ships. The measure seems intended to decrease the potential for conflict arising from peacetime harassment, although it may also be valuable in time of crisis.

Several additional restrictions on military operations have been proposed, but no agreements have been reached. The Soviet Union first proposed significant restrictions on military operations in the 1950s and has continued to suggest additional measures.[12] In 1969, the Soviets proposed geographic restraints on strategic bomber, nuclear submarine, and nuclear-powered aircraft carrier operations.[13] The Soviet proposals limited strategic bomber operations to national airspace and limited ballistic missile-carrying nuclear submarines (SSBN) patrol areas. Both of these carried (and continue to carry) large military costs for the United States Recently, the Soviets have repeated these proposals and also suggested the establishment of anti-submarine warfare-free zones.

The remainder of this paper addresses the utility of operational restrictions on strategic forces in a U.S.-Soviet nuclear crisis. In particular, it examines the role of de-escalatory strategic force CBMs in a superpower crisis. However, it first briefly examines the threatening nature of nuclear alerts and outlines potential de-escalatory CBM benefits.

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[11]In a European crisis, a withdrawal of heavily armored forces 200 kilometers from the intra-German border would not preclude a surprise attack by relatively poorly armed forces, although the likelihood of achieving significant war aims seems low given the importance of armored forces in conventional war.

[12]Raymond Garthoff, "The Accidents Measures Agreement," in John Borawski, ed., *Avoiding War in the Nuclear Age: Confidence-Building Measures for Crisis Stability*, (Boulder: Westview Press, 1986), pp. 61–62.

[13]*Ibid.*, p. 61.

III. THE THREATENING NATURE OF NUCLEAR ALERTS

CBMs may perform an important de-escalatory role in a terminating nuclear crisis by decreasing the threat of nuclear conflict. This section examines the psychological, military, and political threats associated with nuclear alerts and outlines associated de-escalatory CBMs benefits.

PSYCHOLOGICAL THREATS

Military and political threats are often the focus of attention in a nuclear alert; however, psychological threats are perhaps the most poignant in nuclear crises. Psychological threats result from several factors. First, nuclear alerts carry a *realization* of the increased probability of global nuclear war. This realization must be a remarkably sobering event considering the potential loss of human life and property and the virtual elimination of modern civilization. The magnitude of this psychological threat was described clearly in Robert F. Kennedy's account of President Kennedy's reaction to the first Soviet submarine approaching the U.S. blockade during the Cuban Missile Crisis:

> Was the world on the brink of a holocaust? Was it our error? A mistake? His hand went up to his face and covered his mouth. He opened and closed his fist. His face seemed drawn, his eyes pained, almost gray. For a few fleeting seconds, it was almost as though no one else was there and he was no longer the President.[1]

Second, nuclear alerts carry a psychological threat since their relatively rare occurrence emphasizes their legitimacy. Alerts amplify the importance adversaries place on the superpower dispute. For example, it is unlikely that the U.S. or the Soviet Union would alert their respective nuclear forces unless a dispute threatened its existence or vital interests. In short, nuclear alerts highlight the dramatic risks and potential consequenses superpowers consider acceptable to other alternatives.

Third, alerts carry a psychological threat since they emphasize *deliberate* crisis escalation. This contrasts with accidental or unintended actions which precipitate or escalate crises. The former offers visions of powerful, headstrong adversaries bearing toward an unavoidable collision and provides little hope of a peaceful resolution. Accidental or unintended actions project neither the pessimism or the perception of unavoidable conflict inherent in deliberate crisis escalation.

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[1]Robert Kennedy, *Thirteen Days*, (New York: Norton and Company), 1969, pp. 47–48.

Finally, nuclear alerts greatly increase the perception that the world may be at the brink of *accidental* nuclear war. Leaders may fear that they are poised on a slippery slope or engaged in an uncontrollable series of events over which they have little control. Moreover, leaders may fear that one mistake, perhaps relatively minor, may lead to accidental conflict. For example, during the Cuban Missile Crisis, U.S. reconnaissance flights over the Soviet Union were not curtailed as Kennedy apparently had instructed, leading Khrushchev to question Kennedy's intentions. It is unlikely, although not impossible, that similar events in the future might lead to accidental conflict.

CBMs, particularly those which influence perceptions, may mitigate the magnitude of these psychological threats in several ways. For example, declaratory and other CBMs allow nations to highlight and acknowledge the seriousness of the alert and its possible consequences and decrease the psychological threat. These CBMs may serve as a firebreak in the escalatory ladder, provide valuable time to allow adversaries to reconsider actions, and may create a more positive negotiating atmosphere. CBMs which facilitate the exchange of information may also mitigate psychological threats. For example, information exchange may highlight an adversary's efforts to limit crisis escalation and overtly demonstrate his deliberate efforts to resolve the crisis.

MILITARY THREATS

Nuclear alerts threaten military forces and their associated missions. Nuclear alerts may also increase the dangers associated with military operations. In particular, asymmetric nuclear alerts may create conditions under which an attacker using a small number of warheads destroys a large number of defender forces. Alerts also threaten military forces and missions by creating an environment in which the probability of accidental nuclear war increases.

Asymmetric alerts pose perhaps the most serious military threat. For example, an alert by the Soviet Union to which the U.S. does not immediately respond threatens U.S. capabilities and may increase the likelihood of the Soviets dominating a nuclear conflict. For example, a Soviet attack on non-alerted U.S. forces would likely result in highly asymmetric post-attack warhead levels.[2] Asymmetric alerts may arguably limit U.S. retaliatory options to attacks against population and industry.[3]

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[2]The post-attack Soviet-to-U.S. ratio would be about 2 to 1.

[3]It is unlikely that the Soviet advantage would be sufficient to coerce the United States into surrender without a retaliatory attack regardless of the U.S. alert level. For example, an alerted Soviet attack on non-alerted U.S. forces today results in about 4,000 U.S. second strike warheads. Specific counterforce or counter-military options might be somewhat limited, although attacks

However, symmetric alerts also carry military threats for several reasons. First, alerts threaten the missions of nuclear and conventional forces. In particular, the threat of nuclear attack may greatly diminish the missions and capabilities of conventional forces. In short, nuclear threats may reduce the range of conventional force options and weaken extended deterrence.

Second, alerts increase the likelihood of misinterpretation and accidental conflict and increase the danger associated with military operations. These dangers result from the misinterpretation of actions *between* opposing forces and miscommunication *among* one's own forces. For example, the misinterpretation of benign activities as hostile may increase pressures for countervailing measures and unnecessarily escalate the crisis. Faulty intelligence assessments may provide similar results. Similarly, miscommunication among forces, including the misunderstanding of military orders, may result in more threatening yet unintended military actions.[4] This may also unnecessarily escalate the crisis.

Finally, lengthy alerts may increase the likelihood of nuclear war by endangering the sustainability of forces. For example, the United States might be unable to maintain its nuclear bomber forces on high alert for more than several weeks. This limits United States options and arguably creates conditions under which the United States must initiate a conflict or continue the alert under undesirable conditions.

CBMs which focus on information exchange or restrict military operations may decrease these military threats. For example, formal or implicit agreements may preserve the symmetry of alerts and decrease the perceived threat to military forces. Information exchange, by distinguishing threatening from benign actions, also decreases these military threats. For example, information exchange may reduce the likelihood of misinterpretation between forces and slow crisis escalation. Finally, CBMs which restrict military operations may decrease the threat to nuclear forces. For example, the establishment of a Soviet SSBN keep-out zone in the Atlantic may reduce the threat of a surprise attack against U.S. command and nuclear forces.

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against Soviet population and industry could be accomplished. Whether a Soviet surprise attack which destroys a large number of U.S. weapons would force the United States into surrender is an often-debated issue.

[4]The rapidly changing pace of a crisis may exacerbate this problem. For example, hastily given military orders are likely less clear than those given in peacetime, may be ambiguous, and may increase the likelihood of unintended military actions.

POLITICAL THREATS

Nuclear alerts also result in political threats. Alerts threaten the post-crisis superpower political relationship, but may also clearly identify post-crisis winners and losers. The latter may significantly and adversely alter the superpower relationship.

Nuclear alerts, even if resolved in a relatively calm manner, may threaten the U.S.-Soviet political relationship by creating a post-crisis environment in which mistrust is heightened. This may harm economic, diplomatic, and cultural relations. In short, alerts may threaten to change the status quo and establish a new and potentially less favorable relationship.[5]

Alerts may also threaten the future political relationship if the process creates the perception of clear winners and losers.[6] In this case, alerts alter superpower roles and expectations. For example, a non-negotiated termination of a U.S. alert (conventional, as well as nuclear) following Soviet incursions into Iran may be interpreted as increasing U.S. reticence to risk nuclear conflict for its Persian Gulf interests. Soviet risk-taking in this geographic area may increase in the post-crisis environment, while future U.S. security guarantees to Iran and other allies may seem hollow. In this case, there is clearly a political cost to the United States

CBMs, particularly those which influence perceptions and restrict military operations, may reduce these political costs. Declaratory policies, for example, may allow the United States and Soviets to formally re-establish the status quo and limit the potential harm to the superpower relationship. Restrictions on military operations, particularly in a lengthy crisis, may limit crisis escalation, create the perception of a less serious crisis, and reduce damage to political relationships. These measures may also help to create the perception of an equitable settlement and create more favorable conditions to terminate the crisis.

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[5]One might also argue that the opposite is true. For example, relations may improve following the crisis. This occurred following the Cuban Missile Crisis, although the improvement in relations was modest and relatively short-lived.

[6]In a lengthy crisis, the political costs of "losing" may be more acute. For example, a lengthy crisis may back players into corners and limit equitable political solutions. This may create greater relative political costs than a short crisis.

IV. U.S. AND SOVIET PEACE-TO-CRISIS TRANSITION

In a nuclear crisis, the United States and the Soviet Union would increase the alert levels of their military forces to prepare for war, minimize vulnerabilities, and to send military and political signals.[1] This section examines military operations in a peacetime to crisis transition.

U. S. OPERATIONS

The United States utilizes a multi-stage alert process based on five Defense Condition (DEFCON) levels. Forces are normally maintained at DEFCON 5, with the exception of the Strategic Air Command (SAC), which is maintained at DEFCON 4. DEFCON 1 may signify tactical warning of a conventional attack.[2]

The United States has raised its global DEFCON alert levels three times.[3] Historical records of these alerts illustrate transformations in military operations in a superpower crisis. Table 1 summarizes these changes.[4]

Many changes in U.S. strategic forces in a crisis are visible, while others are not easily discernable. Most of the visible changes in U.S. strategic posture occur in strategic bomber and integrated force operations, although important and visible changes also occur in strategic submarine operations. Other operational changes, primarily concerning nuclear command and control, are relatively less visible.

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[1]This section relied heavily on Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 75–121.

[2]Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 101 and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 78.

[3]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 76 and Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 101.

[4]Tables 1 and 2 (which will show Soviet operational changes) demonstrate major changes in an escalatory ladder format. For example, increased U.S. reconnaissance would occur early in a crisis—the relocation of U.S. leadership would occur late in the crisis.

Table 1

CHANGES IN U.S. STRATEGIC AND INTEGRATED FORCE OPERATIONS IN A NUCLEAR CRISIS

Integrated Operations	Strategic Force Operations
Increased reconnaissance.	ICBMs
Transformation of intelligence to early-warning sensors.	—Increased maintenance.
	—Evacuation of non-essential personnel.
Increased security around bases, leaders.	
Augmentation of TACAMO[a], PACCS[b] operations.	SSBNs[c]
	—Surge from port.
Command and control system testing.	—Increased maintenance.
Surge in communications.	
Preparation of emergency control centers.	Strategic bombers
	—Increased bomber and tanker strip alert.
Increased civil defense measures.	—Increased bomber and tanker airborne alert.
Transition from negative to positive weapons control.	—Transfer of medium-range bombers to conflict area.
Relocation of leadership to NEACP.	—Aircraft dispersal from main bases.

[a]Take Charge and Move Out.
[b]Post Attack Command and Communications System
[c]Strategic nuclear ballistic missile-carrying submarines.

Changes In Command and Control and Other Operations

Many of the changes in U.S. forces focus on command and control. The alert levels of the four E-4B aircraft which support the U.S. National Emergency Airborne Command Post (NEACP) mission would be increased as the aircraft moved from their peacetime locations at Strategic Air Command (SAC) bases in Nebraska and Indiana to Washington or other designated areas.[5] If not before, by DEFCON 2, it is likely that the Vice-President would board a NEACP aircraft. The Strategic Air Command (SAC) would also likely increase the number of its airborne command posts at DEFCON 3.[6]

[5]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 97. One aircraft is normally kept on ground alert. NEACP aircraft are hardened against the effects of nuclear explosions and have a wide variety of communications equipment. For additional information, see the Air Force Almanac issue in *Air Force Magazine*, May, 1988. NEACP can remain aloft 24 hours unrefueled and 72 hours refueled.

[6]SAC maintains at least one airborne command post,"Looking Glass," aloft at all times. However, SAC has additional command and control assets. For instance, in the 1973 Middle East crisis, CINCSAC augmented airborne command post capabilities by placing an aircraft on ground

SAC would be expected to augment the Post Attack Command and Communications System (PACCS) in a nuclear alert. PACCS supports SAC's airborne command post missions and serves as auxiliary command posts, radio-relay aircraft, or airborne launch control aircraft (ALCC).[7] The U.S. Navy would likely augment ballistic submarine command and control and other assets by increasing the number of TACAMO[8] aircraft aloft. Finally, the United States would experience a surge in communications traffic as forces were alerted. This might become more noticeable as command and control systems were tested.[9]

The United States would also initiate other significant changes in integrated force operations. For example, as the crisis progressed, the appropriate civilian and military leadership would be evacuated to airborne command posts or pre-designated ground locations. Military leaders would be evacuated to the Alternate National Military Command Center to evaluate U.S. war-waging capabilities following a Soviet attack,[10] and peacetime intelligence sensors would revert to early warning sensors.[11] Finally, officials would recall military personnel and cancel leaves during a crisis.[12]

Changes in Strategic Nuclear Force Operations

Significant changes would also occur in U.S. strategic nuclear force operations in a nuclear crisis. Few visible changes occur in ICBM operations, while significant and visible changes occur in ballistic missile submarine and strategic bomber operations.

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alert and readying other assets for take-off. Scott D. Sagan, [Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 113.

[7]Alan Vick and James A. Thomson, *The Military Significance of Restrictions on Strategic Nuclear Force Operations*, The RAND Corporation N-2113-FF, 1984, p. 9. PACCS consists of three "Looking Glass" aircraft, two relay aircraft, and three ALCC aircraft.

[8]TACAMO stands for Take Charge And Move Out. The TACAMO aircraft inventory consists of EC-130 and EC-135 aircraft. According to one source, only EC-130 aircraft are in the TACAMO inventory. At least one aircraft is airborne at all times in the Atlantic and in the Pacific. See "System Profiles," in *C3I Handbook*, (Palo Alto: EW Communications, 1987), pp. 73-77.

[9]Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 125.

[10]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 85.

[11]For example, Cobra Dane, a ground radar system in Alaska, would revert to an early warning sensor at DEFCON 3. *Ibid.*, p. 84.

[12]The United States apparently recalled personnel during a 1962 DEFCON 3 training exercise. See Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 105.

The most significant changes in strategic bomber operations are the dispersal of aircraft from main operating to staging bases and the increase in the number of aircraft on alert. U.S. strategic bombers are normally kept at 17 main operating bases (MOBs) in peacetime.[13] As a crisis develops, aircraft are likely to be dispersed to remote staging bases. The exact number and location of these staging bases is, of course, closely held, but it seems likely that each squadron of approximately 16 aircraft will disperse to between 3 and 5 staging bases. Thus, the number of strategic bomber bases in a crisis likely falls between 50 and 85.[14] Both tanker and bomber aircraft were dispersed to staging bases in the 1962 Cuban Missile Crisis,a 1962 DEFCON 3 training exercise, and the 1973 Middle East DEFCON 3 alert.[15]

The number of strategic bombers and tankers on strip or airborne alert would undoubtedly increase in a crisis, particularly at DEFCON 2. Normally, the United States maintains approximately 40 percent of its strategic bomber and tanker forces on five-minute alert.[16] This might increase to 60 to 70 percent at DEFCON 3 and more than 90 percent at DEFCON 2. In fact, the United States did increase the number of aircraft on strip alert in the 1973 Middle East crisis, although the early termination of the crisis precluded further generation.[17] It is unclear whether the United States would initiate airborne alert for a portion of the tanker and bomber force, although prudent crisis management indicates that this is likely.[18] During the Cuban Missile Crisis, the United

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[13]Air Force Almanac, *Air Force Magazine*, May 1988. 16 are located in the continental United States; one is at Anderson AFB in Guam.

[14]The number of aircraft at each staging base is probably about 4. Thus, each standard-sized bomber squadron will disperse to 4 staging bases. However, some squadrons may contain more than 16 total aircraft and may disperse to additional sites. At any rate, this number is fairly consistent with other estimates. See Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 99, fn. 58. A FEMA map of "High-Risk Areas" lists 40 strategic bomber bases, which probably includes staging bases. See "Surviving Nuclear War: U.S. Plans for Crisis Relocation," *Armed Forces and Society*, Fall 1985, p. 75.

[15]Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), pp. 109, 125–126.

[16]Bruce Blair, *Strategic Command and Control:: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), p. 311. Vick and Thomson assume a 30 percent alert rate.

[17]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 88.

[18]Airborne alerts no longer occur in peacetime. The 1966 B-52 Palomares and 1968 B-52 Greenland crashes caused the early cancellation of this practice. High operational costs have also been a factor. Donald R. Cotter, "Peacetime Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings

States maintained approximately one-eighth of the strategic bomber and tanker force on airborne alert.[19] SAC might also transfer medium-range FB-111A bombers from bases in New Hampshire and New York to potential conflict areas.[20] This is particularly likely in a European conflict. Historical evidence indicates that SAC might also move reconnaissance aircraft overseas and increase the number of reconnaissance missions.

The United States would also undertake changes in its ICBM and SSBN operations, although changes in ICBM operations would be minimal.[21] Likely changes in ICBM operations include increased site maintenance, relocation of non-essential personnel from launch sites, and a decrease in training activities.[22] In the 1973 Middle East Crisis, the United States increased ICBM maintenance,[23] while in the 1962 DEFCON 3 training exercise, SAC reduced ICBM training activities.[24] If mobile ICBMs are deployed, a future alert would likely include their dispersal from main garrisons.

Significant and more visible measures would be undertaken to increase the alert rates of SSBNs and other naval forces. Normally, about 60 percent of the U.S. SSBN force is alert and at sea; the remainder are in port in South Carolina, Washington, and

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Institution, 1987), p. 29 and Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), p. 205.

[19]Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 109.

[20]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 99.

[21]ICBMs are nearly 100 percent alert in peacetime.

[22]Alan Vick and James A. Thomson, *The Military Significance of Restrictions on Strategic Nuclear Force Operations*, The RAND Corporation N-2113-FF, 1984, p. 7; Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 88, Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 105.

[23]Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 121.

[24]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 98.

Scotland.[25] In a crisis, those in port not undergoing major maintenance would likely be put to sea.[26]

Finally, a future crisis might include significant changes in strategic defense operations. For example, air defense and ABM batteries and fighter/interceptor aircraft might be alerted.[27]

SOVIET OPERATIONS

The Soviets also use a multi-stage alert system, although the specifics of the system are relatively unknown.[28] The Soviets have, in fact, apparently never exercised a nuclear alert.[29] In addition, Soviet force posture, with a majority of warheads on ICBMs, provides few indications of operational change. Despite these limitations, some Soviet operational changes in nuclear alert should be visible. Table 2 illustrates changes in Soviet operations in a nuclear crisis.

Changes in Command and Control and Other Operations

Integrated operations would likely undergo significant changes in a nuclear alert. First, the Soviets would certainly augment their command, control, and communications systems. In a serious crisis, Soviet leaders would be transported to a waiting airborne command post outside Moscow or dispersed to one of many shelters outside Moscow.[30] Additional changes would occur as airborne control posts were augmented. The Soviet

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[25]Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), p. 311 assumes a 55 percent rate. Vick and Thomson, p. 8 assume a 50 percent alert rate. SSBN bases are in Charleston, Bangor, and Holy Loch, respectively. See William M. Arkin and Richard W. Fieldhouse, *Nuclear Battlefields: Global Links in the Arms Race*, (Cambridge: Ballinger, 1985), p. 185, 206, 212, 234.

[26]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*," Washington: The Brookings Institution, 1987), pp. 88–89.

[27]In the Cuban Crisis, the United States reinforced air defenses in Florida. Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 106.

[28]Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 506 fn 96.

[29]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 76–77.

[30]Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 502. Meyer estimates between 1,500 and 2,000 such shelters near Moscow. See Stephen M. Meyer, "Soviet Nuclear Operations," *Signal*, December, 1986, p. 47.

Table 2

CHANGES IN SOVIET STRATEGIC AND INTEGRATED FORCE OPERATIONS IN A NUCLEAR CRISIS

Integrated Operations	Strategic Force Operations
Increased reconnaissance.	ICBMs
Transformation of intelligence to early-warning sensors.	—Increased maintenance. —Evacuation of non-essential personnel.
Transfer of nuclear weapons from storage to launch platforms.	—Increased air defense at ICBM sites.
Command and control system testing.	SSBNs
Augmentation of airborne command posts.	—Surge from port.
Increased civil defense measures.	—Increased maintenance.
Increased jamming of U.S. communications.	Strategic bombers
Re-location of NCA.	—Increased bomber, tanker strip alert. —Dispersal from main bases. —Increased bomber, tanker airborne alerts.

Army has 10 such posts at its disposal, and the Navy apparently has a limited number of TACAMO-styled air assets for communications with sea-based forces.[31] The Soviets would also likely accelerate testing of their communications links, early warning radar systems, and fire and control systems in a nuclear crisis.[32]

Additional changes in integrated force operations in a nuclear crisis may include an increased jamming of U.S. and allied communications, the activation of air defense systems, particularly near ICBM and bomber sites, and the transfer of nuclear warheads from storage sites to launch platforms.[33] Jamming might occur only in a deep crisis immediately prior to the expected onset of hostilities, while the transfer of warheads and the activation of air defense systems would likely occur relatively early in a serious crisis.

[31]Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 507, and Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Spring 1985 (Vol. 9, No. 4), p. 122.

[32]Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 494, fn. 62, and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 104.

[33]Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 105.

Anti-satellite operations might also commence in a deep crisis. Finally, we might expect the Soviets to begin "hasty hardening" of industry, fallout shelters, military facilities, and to initiate other civil defense activities.[34]

Changes In Strategic Nuclear Force Operations

Changes in Soviet strategic nuclear force operations in a crisis would probably parallel changes in U.S. operations. For example, we would expect marginal changes in readiness at ICBM sites similar to those in the United States[35] Strategic bomber alert rates, less than 10 percent in peacetime, and submarine alert rates, perhaps 20 percent in peacetime, would increase. In a lengthy crisis, nearly all submarines and bombers might be alerted and put to sea or dispersed to staging bases, respectively. The Soviets would probably deploy their Typhoon- and Delta-class SSBNs in sanctuaries such as the Barents Sea.[36] Yankee submarines, however, due to range limitations of their SS-N-6 and SS-N-17 Submarine-Launched Ballistic Missiles (SLBMs), would probably be deployed off the U.S. mid-Atlantic coast. This would shorten the flight time to U.S. political and military facilities, preserving Soviet political pressure and increasing the opportunity for a successful Soviet decapitating attack.[37]

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[34]The shift from peacetime to near-wartime footing would require approximately one week. Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 497, fn. 72.

[35]One source argues that Soviet ICBM rates are much lower than U.S. rates. Desmond Ball, *Soviet Strategic Planning and the Control of Nuclear War*, Reference Paper #109, Canberra: The Australian National University, 1983, p. 20.

[36]Jan Breener, "The Soviet Navy's SSBN Bastions: Evidence, Inference and Alternative Scenarios," *Journal of the Royal United Services Institute for Defence Studies*, Vol. 130, no.1, March, 1985, and David B. Rivkin, Jr., "No Bastions for the Bear," *United States Naval Institute Proceedings*, April, 1984, pp. 36–43.

[37]The Soviets have stationed at least one Yankee-class submarine off the Mid-Atlantic states since the 1960s, but only recently reduced the cruise distance from shore. See Alan Vick and James A. Thomson, *The Military Significance of Restrictions on Strategic Nuclear Force Operations*, The RAND Corporation N-2113-FF, 1984, p. 8, Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 450, and Bruce G. Blair, "Alerting in Crisis and Conventional War,[in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 139. Also see "3 Soviet Submarines Said to Patrol Atlantic Box," *New York Times*, October 6, 1986, p. 6.

V. COSTS AND BENEFITS OF DE-ESCALATORY STRATEGIC FORCE CBMs

The main objective of this paper is to evaluate the net benefits of specific strategic force de-escalatory measures in building confidence. The paper previously outlined likely changes in U.S. and Soviet operations in a peacetime-to-crisis transition. This section examines the utility of de-escalatory strategic force confidence-building measures.

It is neither practical nor efficient in this paper to examine all potential strategic force de-escalatory CBMs.[1] Many potential CBMs, such as the return of non-essential personnel to ICBM launch sites or the return of normal communications traffic are not easily identifiable or verifiable. This greatly reduces their suitability as CBMs. Other measures, although identifiable and verifiable, may do little to build confidence. For example, the termination of command and control system testing might do little to increase confidence about enemy intentions or to constrain enemy capabilities. In this case, adequate testing and war preparations may have already occurred, reducing the utility of the measure.

This section evaluates the utility of several potential strategic nuclear and integrated force CBMs. Integrated force CBMs examined include:

- The grounding of supplemental airborne command posts.
- The return of supplemental early warning systems to intelligence-gathering systems.
- The termination of interference with communications and NTMs of verification.
- The return of civilian leadership from emergency locations.
- The termination of civil defense measures.

This section also examines the utility of specific strategic nuclear force CBMs. These include:

- The return of mobile ICBMs to main garrisons.
- The return of ballistic missile-carrying submarines to port.
- The withdrawal of ballistic missile-carrying submarines from waters near national command centers.

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[1] De-escalatory conventional force CBMs probably outnumber de-escalatory nuclear force CBMs. See Joseph E. Nation, *Force Stand-down and Crisis Termination*, The RAND Corporation, P-7292-RGS, 1986.

- The return of strategic bombers to main operating bases.
- The decrease in strategic bomber and tanker alert rates.

This section evaluates the costs and benefits of potential CBMs in terms of confidence-building measure and national objectives. The utility of each potential measure is evaluated under the following criteria:

- Does the measure reduce the psychological threat and add significant insight into an adversary's intentions? Specifically, does the measure reduce the perceived threat of attack? Can the United States and the Soviets be reasonably certain that each party has implemented the measure?
- Does the measure establish roadblocks in the military escalation process and complicate the path to war? In particular, does the measure make a surprise attack more difficult and less likely to succeed?
- Does the measure have an asymmetric effect on U.S. or Soviet operations? If the crisis re-escalates, are either U.S. or Soviet forces at a disadvantage?
- Does the measure reduce the potential for accidental or unintended conflict?

This paper evaluates these measures on a case-by-case basis—in a crisis situation, these measures would almost certainly be evaluated on both an individual and aggregate basis. This paper also does not address in detail the origin or form of de-escalatory strategic force CBMs. For example, CBMs may take a number of forms, ranging from formal to informal or unilateral versus bilateral. Similarly, CBMs may be negotiated prior to a crisis or during a crisis.

INTEGRATED FORCE CBMs

The Grounding of Supplemental Airborne Command Posts

In a crisis, U.S. and Soviet airborne command posts would be augmented with additional aircraft to ensure communication with nuclear forces. Although the primary objective of this action is probably to ensure communications *after* a nuclear attack and therefore to enhance deterrence, this might be interpreted as a prelude to a coordinated nuclear attack. Grounding some of the posts might increase confidence that nuclear war was no longer likely.

An agreement to ground U.S. and Soviet supplemental airborne command posts may be an appropriate CBM *despite* its failure to satisfy many CBM objectives. These failures result from notable asymmetries in U.S. and Soviet forces and nuclear operations. First, the United States is significantly more dependent on airborne control assets than the Soviets. Second, grounding supplemental airborne command posts, while decreasing

the Soviet perception of a U.S. attack, contributes only marginally to increasing U.S. confidence that a large-scale Soviet nuclear attack is less likely. Third, grounding U.S. assets, while perhaps only marginally affecting U.S. capabilities to launch an immediate retaliatory attack, affects protracted war-fighting plans and may arguably weaken deterrence. This measure, however, marginally decreases the perceived threat of a attack, is relatively verifiable, and most importantly, does not seriously threaten robust U.S. or Soviet retaliatory attacks. The measure also does not seriously impair U.S. or Soviet nuclear operations if the crisis re-escalates. In short, this measure may be suitable in building confidence, particularly if the United States is able to obtain commensurate Soviet action in another area.

Grounding some U.S. airborne command posts probably leads to modest decreases in the perceived threat of attack since airborne posts play an important role in U.S. nuclear operations. This decrease in the perceived threat of attack is likely even though the primary role of supplemental U.S. airborne posts is to coordinate post-attack U.S. forces. The Soviets would likely view the grounding of aircraft as an indication that the United States no longer considered a U.S. first or retaliatory nuclear attack probable.

Soviet emphasis on ground communications points to a marginal role for airborne assets,[2] and grounding these assets in a crisis may not significantly build U.S. confidence. However, this may slightly decrease U.S. perceptions regarding the likelihood of a Soviet attack.

Verification difficulties may diminish the suitability of this measure. For example, the relatively small number of airborne aircraft might decrease confidence that the measure had been implemented or that each party would continue to observe the measure.[3] However, confidence that the measure had been implemented would increase over time.

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[2]Normal Polmar, "Soviet C^3: An Overview," *Signal*, Vol 39, No. 4 (December, 1984), p. 25. Also Stephen M. Meyer, "Soviet Nuclear Operations," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 470–534. The Soviets may be increasing the emphasis on airborne command assets. Jim Bussert, "Wartime Needs Give Direction to Soviet C^3 Technology," *Defence Electronics*, May 1985, pp. 150–153. Additional information on the marginal role for Soviet airborne command posts is found in Desmond Ball, *Soviet Strategic Planning and the Control of Nuclear War*, Reference Paper #109, Canberra: The Australian National University, 1983, p. 19, p. 21, fn. 53. Ball argues, for example, that the Soviets do not have TACAMO assets. One explanation for this is that the TACAMO mission is unnecessary given secure Soviet ground communications and SSBN bastions. This contradicts other sources cited earlier in this paper.

[3]Monitoring Soviet compliance may be particularly difficult given the small number of aircraft.

De-escalatory CBMs should complicate the path to war and decrease the likelihood of a surprise attack. Grounding airborne assets modestly complicates the path to war; however, it does not decrease the likelihood of a surprise attack.

Both U.S. and Soviet airborne assets contribute greatly to enhancing command and control of forces, although the relative importance of U.S. assets in preparing for conflict is clearly greater. The grounding of supplemental U.S. airborne assets may complicate U.S. plans for conflict. For example, U.S. military leaders would be forced to rely upon limited command and control assets, including Looking Glass and other redundant command and control assets. Thus, this measure complicates U.S. nuclear operations in a protracted conflict, particularly since the U.S. submarine and bomber forces rely heavily upon airborne communication posts. However, the measure does not create roadblocks in the path to war.

Grounding Soviet airborne assets, however, fails to similarly complicate Soviet war plans since Soviet nuclear operations do not rely heavily on airborne command posts. This measure does not appear to affect Soviet plans for a surprise attack, although Soviet plans for an extended conflict may be adversely affected.

De-escalatory CBMs should also not provide either adversary with asymmetric military or political advantages. Similarly, these CBMs should not result in asymmetric gains should the crisis re-escalate. The evaluation of these objectives requires a brief review of U.S. and Soviet airborne command post systems and missions.

The U.S. airborne command post system provides primary and secondary communication links for the transmission of launch orders to nuclear forces.[4] The most

[4]The missions and vulnerabilities of U.S. forces have been well documented. See Bruce Blair, *Strategic Command and Control:Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), and Alan Vick, "Post-Attack Strategic Command and Control Survival: Options for the Future," *Orbis*, Spring 1985, pp. 95–117. Vulnerabilities include limited command post aircraft hardness against nuclear effects, particularly electromagnetic pulse (EMP) and magnetohydrodynamics (MHD). See Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), p. 190, 194. Neither PACCS, TACAMO, or ALCC aircraft are hardened against nuclear blasts. SAC's "Looking Glass" also appears not hardened against nuclear effects. Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), pp. 137–175, 187–201. All E-4B aircraft probably are hardened, although this was not always the case. See *Air Force Magazine*, May, 1987, p. 175. U.S. command post aircraft communications capabilities also appear vulnerable since they rely primarily on jammable, short-range (400 nautical miles) line of sight UHF transmissions. In particular, PACCS aircraft form an aerial communications chain to send launch orders from NEACP or other national command facilities. If any one of the aircraft is disabled, it may not be possible for well-coordinated launch orders to make their way to SAC bases.

critical command post aircraft are the four E-4Bs which serve the NEACP mission. These are based at Offutt Air Force Base (AFB) in Nebraska, although the primary alert NEACP aircraft is based at Grissom AFB in Indiana.[5] As the national command post and first link in the U.S. airborne command authority post-attack, it is important that NEACP survives the initial- and trans-attack period. Other U.S. command post aircraft, including SAC command and relay aircraft in the mid-west, CINCPAC's command posts in Hawaii and CINCLANT's in Virginia, and TACAMO aircraft in California, Hawaii, Bermuda, or Maryland are less critical, but nevertheless important in a post-attack environment.[6]

Unlike the United States, the Soviet airborne command post system is not an important component in nuclear operations. Soviet airborne command posts, although recently more important in SSBN communications, apparently serve as secondary communications links to nuclear forces.

Grounding some U.S. airborne command posts may result in unacceptable costs to U.S. forces should the crisis re-escalate; however, the associated costs of this measure vary greatly with U.S. determination to maintain protracted warfighting capabilities. For example, consider the grounding of NEACP aircraft at peacetime bases. NEACP aircraft at SAC bases in the mid-west on a cold-start strip alert can be airborne in about eight and one-half minutes, about four minutes less than the *flight time from* a Soviet SLBM launched off the U.S. Atlantic seaboard.[7] TACAMO aircraft would be less secure under this measure,[8] although strip alerts could limit this vulnerability. Maintaining some

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[5]Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), pp. 189, 261 and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 97. Until 1983, NEACP was stationed at Andrews AFB in Washington.

[6]CINCSAC's command post may be the most critical in this short list since he probably possesses the authority to order and coordinate a U.S. nuclear attack. Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), pp. 112–113.

[7]Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), p. 189, fn. 15. The total reaction time of U.S. NEACP aircraft may be longer than the cold start time cited here. Any change in alert levels below strip alert might increase NEACP escape time and decrease the likelihood of survival. The SLBM warning time assumes that the Soviet SSBN is about 500 miles off the United States mid-Atlantic coast. In a larger coordinated (and arguably more likely) Soviet attack scenario, the warning time would likely be even greater since U.S. warning sensors would detect Soviet ICBM launches 25 to 30 minutes before any detonation in the continental U.S.

[8]The EC-130s' (Hercules variant) slow departures would also greatly decrease their chances of survival, particularly if the Soviets had several submarines positioned near the U.S. coast and barraged TACAMO bases.

airborne command post aircraft on strip alert would limit damage from a Soviet attack and would increase the opportunity for coordination in the trans- and post-attack phases. In short, an immediate re-escalation of the crisis is unlikely to complicate U.S. operations or reduce the effectiveness of a relatively well-coordinated U.S. retaliatory attack unless the re-escalation results in an immediate Soviet surprise attack.[9]

This measure also does not greatly affect the potential for a strong, albeit less-well coordinated U.S. retaliatory attack against Soviet military facilities, cities and industry for two reasons. First, the likelihood of an immediate Soviet attack following crisis re-escalation is probably relatively low. Second, a well-coordinated retaliatory attack does not depend on the survival of ALCC or PACCS aircraft or all aircraft involved with the NEACP mission. In fact, in an unlikely scenario in which a Soviet attack destroys *all* airborne command posts, the United States could nevertheless launch a massive U.S. retaliatory attack of several thousand warheads. Launch orders to U.S. ICBMs via the Emergency Rocket Communications System (ERCS) and other ground lines would probably enable the launch of at least a small number of ICBMs. In addition, SSBN forces should be able to launch a massive attack on Soviet targets.[10] Thus, this measure might marginally limit U.S. trans- and post-attack communications and decrease the likelihood of well-coordinated post-attack missions, but it does not appear to greatly inhibit an immediate retaliatory attack by U.S. nuclear forces.[11] Similarly, because CINCSAC apparently has the authority to launch a bomber and ICBM attack, the survival of CINCSAC's command post Looking Glass should allow a fairly well-coordinated, rather than a spasmodic U.S. response.

The grounding of Soviet assets does not affect Soviet force regeneration in this situation. Again, this results from the relative unimportance of airborne communications. In the case of an immediate U.S. nuclear attack, short-term Soviet retaliatory operations would not be greatly affected; however, long-term Soviet coordination would likely

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[9]Aircraft strip alerts can mitigate this vulnerability. Moreover, a slow re-escalation over a period of at least several *hours* would permit the United States to re-establish redundant or auxiliary airborne command and control links. In this situation, this measure does not greatly affect U.S. force regeneration or post-attack nuclear communications missions.

[10]SSBN commanders may be able to launch SLBMs without direct orders from TACAMO or NEACP aircraft. U.S. SSBNs warhead levels following a Soviet attack are described shortly.

[11]The survival of a single E-4B supporting the NEACP mission should permit the national leadership to communicate directly with surviving SSBN, bomber, and submarine forces. The survival of one E-4B may permit centralized control and coordinated attacks for several days, but the prognosis over the longer-term is not promising. See Vick, "Post-Attack Strategic Command and Control: Options for the Future," *Orbis*, Spring 1985.

suffer. In either case, the Soviets would remain capable of launching an attack of perhaps several thousand warheads on U.S. targets.[12]

The effects of this measure on the potential for accidental or unintended war are uncertain. Grounding aircraft may reduce the likelihood of miscommunication among forces and thus decrease the likelihood of accidental war. However, leaders also may more widely distribute launch control authority, particularly to submarine and ICBM forces, in order to compensate for decreased airborne communication. This may increase the likelihood of unauthorized conflict.

In sum, the grounding of supplemental airborne command posts has clear asymmetric costs and benefits—most of these favor the Soviets. However, this measure does not affect U.S. or Soviet capabilities to deliver a massive retaliatory attack against military facilities, cities, and industry following a surprise attack nor does it appear to increase surprise attack incentives. As such, this measure may be a suitable CBM, particularly if the United States and Soviets agree on an accompanying measure which favors the United States

The Return of Supplemental Early Warning Systems to Intelligence Gathering Roles

In a crisis, the United States, and possibly the Soviet Union, would likely transform some intelligence gathering sensors to early warning sensors.[13] Early warning

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[12]See the Appendix in Joseph E. Nation, *Force Stand-down and Crisis Termination* , The RAND Corporation, P-7292-RGS, 1986.

[13]The primary U.S. early warning system has been based on ground- and space-based systems since the early 1970s . These include the Defense Support System (DSP), consisting of three satellites in geosynchronous orbit, PAVE PAWS phased-array radars in California and Massachusetts, and the Ballistic Missile Early Warning System (BMEWS). See Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), pp.141–142, 251, Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), pp. 36, 196. DSP provides early warning of SLBM and ICBM launches, while PAVE PAWS provides early warning of SLBM launches. BMEWS also warns of ICBM launches. Currently, Distant Early Warning (DEW) lines, although they contain gaps in low altitude detection and are expensive to maintain, provide warning of Soviet bomber attack.

DSP, BMEWS, and PAVE PAWS are supplemented in peacetime by several additional warning systems. FSS-7 SLBM detection systems operate in six coastal states, although their range is minimal and their effectiveness questionable. An FPS-85 SLBM detection radar in Florida provides warning of SLBM launch from the Gulf of Mexico, Caribbean, and parts of the Pacific Ocean. Congressional Budget Office, *Strategic Command, Control, and Communications: Alternative Approaches for Modernization*, (CBO: Washington, 1981), pp. 9–10. Finally, the Perimeter Acquisition Radar Characterization Radar System (PARCS) in North Dakota, the only remaining active portion of the U.S. Safeguard ABM site, provides detailed early warning information, including the ability to predict warhead impact profile. Bruce Blair, *Strategic*

systems provide warning of a Soviet missile launch and may also assist in battle management functions. This transformation ensures adequate coverage of all possible Soviet launch corridors and establishes redundant measures for assessing tactical warning of a Soviet attack. The Soviets would likely pursue similar measures.[14]

The standing-down of these supplemental early warning systems as an effort to build superpower confidence does not appear to be a prudent measure for three reasons. First, this measure fails to influence perceptions or the threat of attack. Similarly, it does not decrease the incentives for a surprise attack or complicate the path to war. Second, this measure, although observable and verifiable, can be quickly reversed. Third, U.S. and Soviet early warning systems should probably be augmented in a crisis to guard against false alarms, enhance system reliability, and reduce the likelihood of accidental conflict.

Early warning systems do not appreciably reduce the psychological threat associated with nuclear crises nor do they reduce the perceived threat of attack and may

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Command and Control: Redefining the Nuclear Threat, (Washington: The Brookings Institution, 1985), p. 224.

Several peacetime intelligence systems would transform to early warning systems in a crisis and add a modest additional capability to U.S. early warning system. These include Cobra Dane and Cobra Judy, land- and sea-based phased-array radar systems, respectively, and Cobra Ball, an RC-135 support aircraft. Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), p. 223, and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), p. 84; Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), p. 37. Other peacetime intelligence systems likely to change to early warning systems include Pacific Radar Barrier (PACNAR) and radars in Hawaii, San Miguel in the Philippines, Kwajalein Atoll, and possibly other phased array radars in the continental U.S. In particular, radars used for tracking objects in space would probably be transformed into early warning systems. International Institute for Strategic Studies, *The Military Balance* (London: 1987). U.S. sea-based intelligence systems, including Sound Surveillance Systems (SOSUS), sensors used to detect and located Soviet naval vessels near the U.S. coast and Fleet Ocean Surveillance Information Centers (FOSIC) would also likely augment early warning systems. See Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), pp. 14, 37–38. Similarly, additional National Technical Means of Verification (NTMs), including Communications Intelligence (COMINT), Electronic Intelligence (ELINT), and Signal Intelligence (SIGINT) would transform into early warning roles. Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), p. 28.

[14]Very little specific information is available in the open literature regarding Soviet early warning systems, but it appears that the Soviets rely on early warning satellites, possibly three OTH-B radars, and more than a dozen Hen House search-and-track radars. Phased-array radars under construction in the western part of the Soviet Union will form complete early warning coverage. Ball, p. 19. *Soviet Military Power*, 1987, pp. 47–48 suggests two OTH-B radars and 11 Hen House radars on the periphery.

contribute little to building confidence For example, U.S. and Soviet early warning systems and converted intelligence sensors serve virtually exclusively in defensive roles. In the future, Soviet activation of space-tracking phased-array radars and battle-management systems may indicate an increase in strategic defense force readiness and may signal an increased perception in the likelihood of conflict. However, these actions do not presently decrease the psychological threats in crises.

This measure also appear unsuitable because of verification difficulties. It appears simple to detect and monitor most radar and other intelligence system operations; however, short radar re-activation time reduces the level of confidence of continued compliance.[15] This short reactivation time may also increase an aggressor's perception that he can launch a surprise attack against less secure forces and immediately re-activate his systems to defend against a retaliatory attack.

This measure does not appear likely to complicate the path to war or to create roadblocks in the escalation process and thus may be of little use in building confidence. For example, war plans, including those for a surprise attack, may continue uninterrupted despite the introduction of this measure. Similarly, the return of supplemental assets to early warning systems does not appear to slow the escalation process.[16]

This measure does not result in asymmetric costs or benefits if the crisis re-escalates and thus satisfies one CBM objective. Most importantly, asymmetries resulting from re-escalation are mitigated by the short reactivation time of radars and other intelligence and early warning systems. Thus, in virtually all re-escalation scenarios, the United States and the Soviets would be able to re-activate all systems as early warning sensors.

Finally, and perhaps most importantly, this measure may increase the potential for accidental war. For example, numerous reports of U.S. primary system malfunctions and deficiencies[17] have increased concerns that early warning system failure may precipitate

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[15]Reactivation time is likely no more than a few minutes.

[16]In the future, strategic defenses and their heavy reliance on large radars may change the effects of this measure. For example, this measure may complicate the path to conflict by reducing opportunities for strategic defense system testing. However, the utility of a reduction in strategic defense testing is arguably negative since strategic defenses may enhance deterrence. In any event, the utility of this measure following the introduction of strategic defenses appears also not to create roadblocks in the escalation process.

[17]Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), pp. 54–55 and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987).

accidental nuclear war. In particular, the likelihood of accidental conflict may increase in a quickly changing crisis when decisions are made more quickly.[18] Decreases in early warning system redundancy, particularly in a deep crisis, may not be appropriate given these concerns. Redundancy in early warning systems may be desirable from both U.S. and Soviet perspectives.[19]

In sum, this measure does not decrease the perceived threat of attack or complicate the path to conflict, and it may increase surprise attack incentives. Verification problems may also reduce the measure's suitability, but most importantly, this measure may increase the potential for accidental war following primary system failures. In short, this measure does not satisfy most CBM objectives and is not likely to be a suitable confidence building measure.

Agreement to Terminate Interference with NTMs

In a deep crisis, tremendous pressure may mount on U.S. and Soviet leaders to jam or disrupt enemy communications and to interfere with intelligence-gathering systems. Successful disruption or interference may complicate or confuse war preparations as well as deny observation of military activities. This pressure may increase as the crisis deepens.

An agreement to terminate jamming and interference with NTMs in a crisis may be an appropriate CBM for several reasons.[20] First, non-interference with communications and NTMs may provide insight into intentions. Second, this measure is

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[18]False warnings of Soviet attack in 1979 and 1980 raised concerns that accidental nuclear war might occur through system failures. Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), pp. 54–55.

[19]Increasing U.S. system redundancies may be appropriate given current capabilities. For example, U.S. systems provide relatively adequate coverage of Soviet attack, although there are some deficiencies. DSP satellites are limited in field of view capabilities and are vulnerable to glare from clouds and the ocean surface. PAVE PAWS radars represent an improvement over older coastal radar systems, but still suffer from limitations in ability to discriminate and track large-scale Soviet attacks. Although the DSP system's full range of coverage includes virtually the entire globe, satellites have only a fraction of this area in view at any one time and do not have coverage of some Arctic areas from where Soviet SLBM launch is likely. BMEWS cannot accommodate all Soviet ICBM trajectories, nor can it deal with large attacks or predict missile landing points. Paul Bracken, *The Command and Control of Nuclear Forces*, (New Havan: Yale University Press, 1983), pp. 54–55 and Bruce G. Blair, "Alerting in Crisis and Conventional War," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), for an overview of early warning failures.

[20]A corollary to this measure includes agreement not to in other ways impede the missions of NTMs. For example, agreement not to conceal nuclear operations might build confidence in a crisis.

easily verifiable—non-compliance would demonstrate strong signals about intentions. Third, this measure may place firebreaks in conflict escalation and decrease the likelihood of intentional war. Fourth, this measure may reduce surprise attack opportunities and incentives by maintaining the transparency of operations.[21]

The increased jamming of and interference with intelligence-gathering systems clearly highlights intentions. Jamming potentially disrupts an adversary's mobilization—interference with intelligence-gathering systems decreases the transparency of military operations and may indicate attempts to conceal aggressive military intentions. For example, jamming of communications or interference with intelligence-gathering systems in a crisis situation almost certainly indicates belligerent plans—in fact, the latter might be expected to conceal surprise attack preparations.

This measure appears to satisfy CBM verification requirements. In fact, assuring compliance should prove to be straightforward. For example, interference with communications or intelligence gathering, even on a very limited scale, would become obvious in its early stages. Non-compliance on a large scale would amplify intentions.

This measure complicates war plans, provides firebreaks in the escalation ladder, and may reduce the likelihood of intentional war, including surprise attack. For example, this measure maximizes the transparency of military operations and minimizes the likelihood of successful surreptitious military actions. It may also reduce the opportunities for a successful surprise attack and thus diminishes the likelihood of intentional war. Finally, this measure may provide firebreaks in the escalation ladder by exposing war preparations and forcing military leaders to consider less visible and more time-consuming or costly preparations for attack.

The termination of jamming and interference with intelligence assets appears unlikely to create large asymmetries between forces, nor does it hinder U.S. or Soviet operations should the crisis re-escalate. However, the Soviets may consider the measure to be undesirable because of a greater U.S. dependence on satellites and other intelligence gathering systems. As such, termination of jamming and interference with NTMs provides greater U.S. than Soviet benefits. The asymmetric U.S. benefit results from several factors. First, U.S. force deployment,[22] the likely location of a crisis or conflict

[21]Non-compliance or violation of the measure may clarify intentions. For example, an adversary who deliberately sabotages NTMs may do so to conceal threatening intentions.

[22]The United States deploys forces farther from its borders than the Soviets do (such as SSBNs) and thus satellite communication is more critical.

with the Soviets,[23] and planned future proliferation of U.S. satellite assets demonstrate a correspondingly greater U.S. benefit.[24] Second, technical considerations reflect the asymmetric U.S. benefit. The closer the jammer to the receiver, the more probable the jamming is to succeed. Thus, Soviet jamming of communications originating in the United States to troops in Europe is likely to be successful, while U.S. jamming of Soviet transmissions in Europe is less probable to succeed. Third, this measure provides a relatively greater U.S. benefit given the asymmetric nature of U.S. and Soviet societies. While the United States might have to rely almost entirely on NTMs in a crisis,[25] the Soviets may gain important insight into U.S. actions both through NTMs and the unauthorized disclosure of secret information to the media.

This measure also does not provide either the United States or the Soviets with a marked advantage should the crisis re-escalate. For example, the United States and the Soviets can equally quickly re-establish jamming and anti-satellite efforts. Moreover, current anti-satellite force capabilities indicate a lengthy anti-satellite operations effort. These limited capabilities mitigate the potential benefits of breaking out of the agreement.

Finally, this measure may reduce the potential for accidental or unintended conflict by increasing the transparency of operations and minimizing misunderstandings. For example, non-interference with NTMs permits sound and more reliable assessments of adversarial actions and similarly diminishes the possibility of misinterpreting benign actions. The termination of jamming reduces confusion among forces and thus also appears to limit the probability of accidental conflict.

In short, agreements not to interfere with communications or NTMs satisfy many CBM objectives. Most importantly, as CBMs they provide insight into intentions. Such CBMs also complicate the path to surprise attack by limiting opportunities for deception. They may also provide useful firebreaks, although this measure provides asymmetric U.S. benefits. Nevertheless, these measures appear to be useful de-escalatory CBMs.

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[23]Conflict may be more likely to occur in areas nearer the Soviet Union than the United States These include the Persian Gulf, Middle East, Central Europe, and South Asia. A U.S.-Soviet nuclear crisis arising from events in the Western Hemisphere, despite (or as a result of) the historical record, seems less likely.

[24] MILSTAR, for example, will, among other things, provide redundant communication links with SSBNs. *C3I* Handbook, pp. 61–62

[25]HUMINT would be of less help in a crisis as Soviet police arrest suspected U.S. agents.

Agreement to Return Leadership to National Capitals

In a crisis, U.S. and Soviet leaders might be evacuated to pre-designated, secure command centers in order to ensure their survival and the orderly execution of national security objectives. These actions would occur only in a serious crisis.[26]

Returning leadership to national capitals appears important in highlighting intentions and affecting perceptions in a nuclear crisis. However, it does not appear to complicate war plans, may not decrease the incentives for surprise attack, and may asymmetrically favor the Soviets. Thus, it may be only marginally suitable in building confidence.

Leaderships' return to national capitals may provide insight into intentions during a nuclear crisis. For example, the willingness of leadership to expose themselves and their families to the possibility of a surprise attack seems to indicate their perception of a terminating crisis. This measure greatly reduces the psychological threat associated with nuclear alerts.[27]

Despite this implicit change in perceptions, this measure does not satisfy other important CBM objectives. First, it may be extremely difficult to verify implementation of this measure, particularly in the Soviet case. Difficulty in *verifying Soviet compliance* is exacerbated by the relatively closed nature of Soviet society. The open nature of U.S. society minimizes the likelihood that U.S. leaders, who are constantly trailed by dozens of journalists, would successfully violate this measure.

Second, this measure does little to establish firebreaks in the escalation process, or to diminish surprise attack incentives. In particular, it may increase the incentives for a surprise attack against national command authorities. For example, leaders may implement this measure then suddenly depart as a prelude to a deliberate attacks against opposing national command centers. This may increase surprise attack incentives by providing a higher likelihood of a successful decapitating strike.

However, the magnitude of this increase in incentives is probably modest in both U.S. and Soviet cases. In particular, redundant U.S. command and control structure limits Soviet incentives for surprise attack against the National Command Authority

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[26]It is unlikely that the U.S. president would evacuate Washington except in a very grave and worsening crisis; the Vice-President would also not relocate to an alternative command center except in a deep crisis.

[27]I assume that the magnitude of this benefit might be directly related to the personal relationship between U.S. and Soviet leaders. Specifically, a closer friendship might amplify these benefits.

(NCA). A Soviet attack, even if it virtually assures the death of the U.S. President, does not appreciably affect the U.S. capability for a strong retaliatory attack. For example, in the event of the President's death, the U.S. political chain of command passes from the President to the Vice-President to the Speaker of the House and so on. While the nuclear launch authority chain of command is perhaps more fragile,[28] it seems certain that authority has been passed along to some military commanders.[29] A cautious President who fears accidental or unauthorized U.S. launch may fail to delegate such authority, and in the event of the President's death, there is arguably a greater likelihood, albeit small, of U.S. paralysis.[30]

Uncertainty regarding Soviet nuclear command authority associated with this measure may also increase U.S. surprise attack incentives, although only modestly. For example, the Soviet civilian leadership may be reluctant to delegate launch authority to military commanders. This may increase U.S. incentives to attack or decrease the likelihood of Soviet leadership returning to Moscow.

The implementation of this measure may also lead to asymmetric costs and benefits, particularly if the crisis quickly re-escalates. For example, the U.S. leadership is vulnerable to very short-warning attacks by Soviet Yankee- and Delta-class submarines in the Atlantic. The Soviet leadership, particularly following the withdrawal of Pershing II missiles from Europe, is less vulnerable. In addition, Soviet hardened command bunkers near the Kremlin may increase Soviet leadership survival rates. A slow crisis re-escalation mitigates these asymmetries by allowing leadership to evacuate.

Finally, this measure may not decrease the likelihood of accidental conflict. In particular, this measure implies a wider transfer of nuclear launch authority. This proliferation of authority may increase the probability that military or political leaders with launch authority will misinterpret rapidly changing events and consider aggressive

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[28]Or perhaps less fragile and more secure in a crisis.

[29]We do know that this authority apparently has previously been delegated to the NORAD commander and that the commander of SAC apparently has had authority to release nuclear weapons. See Bruce Blair, *Strategic Command and Control: Redefining the Nuclear Threat*, (Washington: The Brookings Institution, 1985), pp. 112-113.

[30]If the chain of command stopped, for example at the Secretary of Labor, the Secretary's limited knowledge of military operations might effectively paralyze U.S. operations. In addition, a surprise Soviet attack might lead to such massive confusion that those in the political chain of succession might not *know* the results of the attack for hours or days. This may also lead to U.S. paralysis, at least in the short term. See Paul Bracken, "Delegation of Nuclear Command Authority," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations*, (Washington: The Brookings Institution, 1987), pp. 361-362.

actions. The proliferation of launch authority may also increase the likelihood of nuclear conflict by aggressive or belligerent officials.

In sum, the return of leadership to national capitals may significantly increase confidence that intentions are benign and nuclear war is unlikely. However, this measure may also lead to increased pressures for a decapitating attack, although this may be mitigated if the National Command Authority is robust and clearly survivable. Verification problems clearly exist, and asymmetries, including the relatively higher likelihood of Soviet leadership survival, diminish the positive aspects of this measure. In the final analysis, the utility of this measure may depend greatly on the existing relationship between U.S. and Soviet political leaders.

Termination of Civil Defense Activities

The Soviet Union and the United States would undertake varying efforts to protect population and industry in a deep superpower crisis.[31] These efforts may include population dispersal, the construction of additional blast and fallout shelters, and hardening of industry. Soviet civil defense efforts would cause considerable alarm in the United States, particularly if efforts continued in a perceived terminating crisis. Continued Soviet civil defense efforts might convince U.S. leaders that the Soviets continued to view conflict as likely. Accordingly, the termination of civil defense activities appears to be a significant CBM from a U.S. perspective. This measure may also be significant from a Soviet perspective, given a recent modest increase in U.S. civil defense efforts.[32]

The termination of civil defense measures may provide valuable insight into intentions inasmuch as civil defense efforts signal an increased perception of the likelihood of war. For example, Soviet leaders would view unfavorably a U.S. order to evacuate cities and implement other civil defense measures. United States efforts to "order" citizens to return to cities may greatly diminish Soviet fears of war. Reciprocal action by the Soviets would similarly reduce U.S. concerns.

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[31] For an overview of Soviet civil defense efforts, see *Soviet Military Thought: No 10, Civil Defense*, (Moscow: Publishing House for Higher Education, 1970). For an overview of recent U.S. efforts, see Edward Zuckerman, *The Day After World War III*, (New York: Viking Press, 1984).

[32] The 1980 Republican Party platform pledged to develop a U.S. civil defense system equal to or superior to the Soviet system. Recent increases in the Federal Emergency Management Agency's (FEMA) emphasis on evacuation procedures amplifies an increased U.S. civil defense effort. Walter Murphy, "FEMA's Office of Civil Defense," *Journal of Civil Defense*, Vol. XX, No. 5, October 1987, pp. 13-14.

However, this measure fails to satisfy other CBM objectives. In particular, this measure may not satisfy CBM verification requirements and may also result in asymmetric costs and benefits.

First, the verification of terminating civil defense activities may a difficult and time-consuming process,[33] and in the end, the level of confidence that the measure had been implemented may be low. Visible signs of termination efforts would be helpful, but would not guarantee full compliance. For example, less visible measures, such as the surreptitious stockpiling of foodstuffs in shelters or hardening of industry might continue unnoticed.[34]

The termination of civil defense efforts may also complicate the path to war by increasing potential civilian losses and thereby increasing the costs of conflict. For example, an aggressor may be reluctant to initiate conflict if expected civilian losses increase significantly following the implementation of this measure. Similarly, this measure may decrease surprise attack incentives since a potential aggressor may be less likely to suffer the effects of a retaliatory attack against exposed civilians.

This measure also results in asymmetric costs and benefits favoring the Soviet Union. First, Soviet civil defense infrastructure indicates a more rapid and perhaps more successful response to crisis re-escalation. Thus, the Soviets may protect citizens and industry more effectively and more rapidly in rapid re-escalation scenarios. Second, a Soviet propensity to accept higher civilian damages may create an asymmetric advantage.[35] Given these lesser relative costs, the Soviets may be more receptive to this measure.

In short, this measure provides significant insight to intentions, particularly in the Soviet case because of their emphasis on civil defense measures. It similarly provides

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[33]The difficulty may be correlated directly with the stage of the crisis and the corresponding presence of foreign citizens in each country. For example, in a less serious or quickly developing crisis, many Americans would still be in the Soviet Union and might be able to assist in verifying Soviet compliance with this measure. In a more lengthy crisis, most Americans would probably have left the Soviet Union.

[34]In addition to these verification problems, the implementation of this measure may be difficult in a crisis. For example, consider a nuclear crisis in which spontaneous evacuation has occurred or in which both the U.S. and Soviets have evacuated cities. Convincing citizens to return as a "good faith" measure might be a troublesome task, even in the Soviet Union where government persuasion is often quite successful. Success in persuading U.S. evacuees to return to cities after a government request may be no more likely than U.S. investors continuing business as usual after the 1987 stock market collapse despite President Reagan's expressed "confidence" in the economy. Citizens might be forced to return as supplies in civil defense shelters were exhausted, although this might take several days.

[35]This theory has been hotly debated.

insight into U.S. intentions, although limited U.S. civil defense efforts reduce this benefit. The measure appears likely to complicate the path to conflict and marginally reduce surprise attack incentives, although it also results in somewhat asymmetric costs and benefits and may not provide high confidence in verification. However, its significant contribution to highlighting intentions probably warrants serious consideration in building confidence. Finally, this measure probably does not affect the potential for accidental nuclear conflict.

STRATEGIC NUCLEAR FORCE CBMs

ICBMs

The high peacetime alert status of silo-based ICBM forces indicates little promise for this CBM category. However, the introduction of mobile ICBMs[36] may increase the suitability of some ICBM-related CBMs. In particular, the return of mobile ICBMs to main garrisons, probably over a period of days or perhaps weeks, might be an appropriate nuclear force CBM. The suitability of this measure depends on several factors, including mobile ICBM deployment patterns, nuclear operations, and survivability of other deterrent forces.

Returning mobile ICBMs to main garrisons may provide insight into intentions and thus satisfy an important CBM objective. In particular, this measure increases ICBM force vulnerability and may reflect the perception that conflict is less likely. Mobile ICBM return to garrison demonstrates a calculated assessment that mobile ICBM forces will not be used in a surprise or retaliatory attack.

This measure may be difficult to verify and may thus fail an important CBM objective. Verification appears to be a difficult task for several reasons. First, uncertainty regarding the aggregate number of ICBMs returned to garrison reduces confidence. For example, although intelligence analysts may be able to verify the return of some mobile ICBMs, analysts may not be able to measure the precise number of mobile ICBMs returned to garrisons. In particular, it may be difficult to determine whether the United States and Soviets have returned a small or large share of their mobile ICBM forces to garrisons. Second, uncertainty regarding total ICBM launchers and the potential use of camouflaged trucks (or trains) complicates these verification efforts.

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[36]Currently, only the Soviet Union has deployed mobile ICBM forces. The Soviets have probably deployed about 100 single-warhead SS-25s and perhaps a dozen or less multiple-warhead SS-24s. Thus, any agreement in a crisis in the near future to return mobile forces to main garrisons would only affect Soviet nuclear operations.

Third, verification difficulties may increase since many of the limited intelligence assets available may be assigned other functions, such as early warning or the monitoring of troop movements.

This measure also fails to complicate the path to war or to reduce surprise attack incentives for two reasons. First, at the present time, mobile ICBMs constitute a small share of total ICBM warheads.[37] Thus, the increase in aggregate force vulnerability is small and would not deter an aggressor. Second, this measure may mask surprise attack plans. For example, an aggressor may return mobile ICBMs to garrisons but immediately disperse mobile ICBMs in conjunction with a surprise attack. This might greatly increase the survivability of an aggressor's mobile ICBM forces. Exchange calculations may provide additional insight into the relative increases in surprise attack incentives.[38]

One measure of changes in surprise attack incentives following mobile ICBM return to garrison is the difference in attacking warheads necessary to barrage and destroy garrison- versus dispersed-mobile ICBM forces.[39] For example, surprise attack incentives may increase if the marginal warhead expenditure required to successfully barrage and destroy most mobile forces in garrison is low relative to warhead requirements to destroy dispersed forces. The following calculations, representing a Soviet attack on U.S. forces, uses several simplifying assumptions. These assumptions are outlined fully in the Appendix.

A Soviet barrage attack on 1,000 U.S. dispersed mobile missiles prior to return to 100 garrisons requires a very high number of attacking warheads. Figure 2 illustrates this requirement, based on various mobile ICBM hardness levels.[40]

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[37]This appears unlikely to change significantly in the future.

[38]This, of course, represents a relatively simple measure of changes in surprise attack incentives.

[39]Another measure (implicit in measuring barrage attack requirements) is the effect of the measure on a defender's second strike warhead levels.

[40]For purposes of illustration, Figure 2 illustrates a barrage attack on mobile missiles with maximum overpressures of 10, 20, and 30 PSI. These represent a range of mobile ICBM hardness.

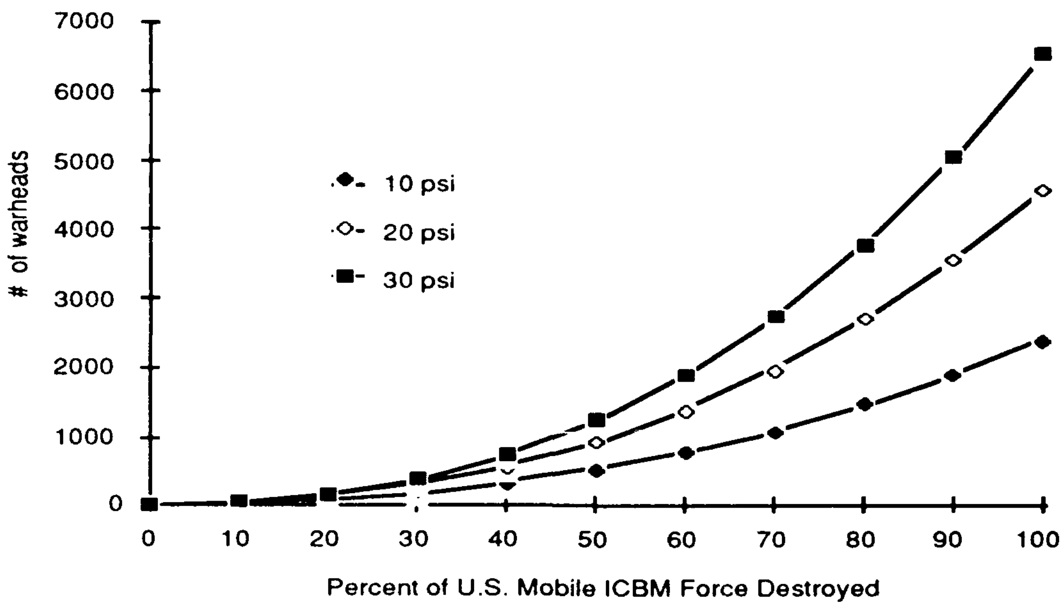

Fig.2—Soviet attack on dispersed U.S. Mobile ICBMs

As Figure 2 illustrates, at 10 PSI mobile missile overpressure, the attacking Soviet warhead requirement to destroy more than 80 percent of the U.S. force is about 1,400. At 30 PSI overpressure, the requirement increases to about 4000. This attack destroys virtually all U.S. mobile ICBMs. Conversely, an attack on mobile ICBMs in garrisons following the implementation of this measure is about 200.[41] A Soviet barrage attack on mobile ICBMs in garrisons clearly entails a much smaller warhead requirement than an attack on dispersed forces. Consequently, this measure may increase surprise attack incentives.

The costs to the United States in attacking dispersed Soviet mobile ICBMs,[42] measured in required incremental warheads, is high, but may be larger than Soviet warhead requirements for two reasons. First, Soviet mobile ICBM reservations will likely be larger than U.S. reservations. Thus, the United States would be required to barrage a larger area to destroy most dispersed Soviet mobile ICBMs. Second, the Soviets, unlike the United States, may expand the size of these reservations in a crisis further increasing the required barrage area. However, in both U.S. and Soviet cases, mobile ICBM return to garrison significantly decreases attacking warhead requirements

[41]This assumes 2 warheads targeted per garrison.

[42]Soviet forces of roughly the same size as notional U.S. forces in the previous example.

and may increase surprise attack incentives. As such, it appears unsuitable in building confidence.

However, the United States and Soviets might consider the phased return of a modest number of mobile ICBMs over a period of several days or weeks. The phased return of mobile missiles increases the vulnerability of forces in garrison, but does not appreciably affect the vulnerability of dispersed forces or Soviet and U.S. attacking warhead requirements. Figure 3 illustrates U.S. mobile ICBMs destroyed by a surprise Soviet attack given various rates of return to garrisons. It represents U.S. mobile ICBMs hardened to withstand 10 PSI overpressure.

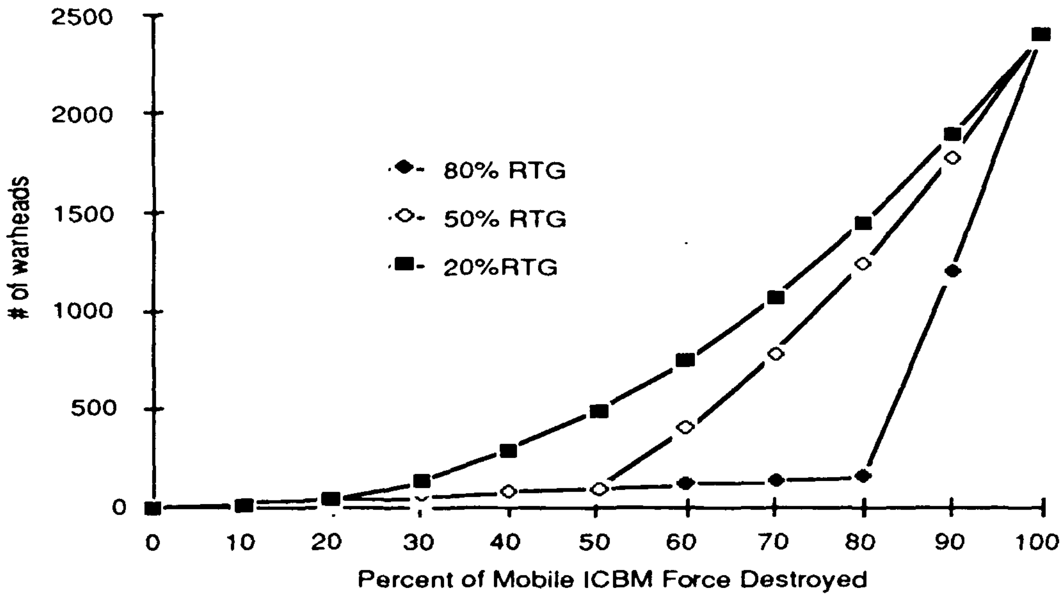

Fig.3—Soviet attack on returning U.S. mobile ICBMs

As Figure 3 indicates, the attack destroys mobile ICBMs in garrisons; however, the incremental costs of destroying remaining U.S. forces remains high.[43] In fact, the requirement remains identical to the dispersed case since the number of attacking warheads must barrage the entire reservation area. For example, in a 50 percent return to garrison scenario, about 100 Soviet warheads destroy approximately the initial fifty percent (500 missiles) of the U.S. mobile ICBM force. However, the average marginal cost of destroying each subsequent U.S. mobile ICBM is between three and four attacking warheads, or an unfavorable attacking-to-destroyed warhead ratio of about 2 to

[43]See the Appendix for more information.

1.[44] In short, although a surprise attack may destroy most U.S. mobile ICBM forces in garrison, the costs to the Soviets of destroying dispersed mobile ICBMs remains high and probably decreases surprise attack incentives. A U.S. attack on returning Soviet mobile ICBMs demonstrates similar results. In short, a phased return of up to 50% of all mobile ICBMs may be a suitable CBM.

The United States and Soviets might also consider a phased return to garrisons since many mobile ICBMs in garrison might survive a surprise attack. In fact, increased garrison alert rates may increase the number of surviving mobile missiles and decrease surprise attack incentives. For example, mobile forces on heightened alert might have as much as 12 to 15 minutes warning and escape time.[45] In a 50% return to garrison scenario, U.S. ICBMs could disperse immediately and significantly increase the required Soviet barrage area. Dispersing at ten miles per hour,[46] the attacking Soviet warhead requirement to destroy escaping mobile ICBMs increases from about 200 to between 450 and 1200, depending on U.S. mobile ICBM hardness.[47] In addition, the aggregate Soviet requirement to destroy more than 80% of all mobile ICBMs remains at about 1900 since the entire reservation must be barraged. Thus, the survivability of mobile ICBMs in garrisons further decreases surprise attack incentives.

An additional criterion requires that CBMs not result in asymmetric costs or benefits or create asymmetries in the crisis re-escalation. At current force levels (i.e., few mobile missiles deployed), this measure satisfies this requirement, although uncertainty about future force structure may lead to more asymmetric results. Crisis re-escalation also seems unlikely to create asymmetries since forces can quickly leave garrisons and immediately decrease their vulnerability.

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[44]This attacking-to-destroyed warhead ratio increases to more than 4 to 1 if mobile ICBMs are hardened to withstand 30 PSI. If, in the 10 PSI and 50% return to garrison case, the Soviets only attempt to destroy about 70% of the mobile ICBM force (i.e., barrage 70% of the reservation), the attacking-to-destroyed ratio is about 1 to 1. Beyond this level, however, the ratio increases greatly. Moreover, an attack on 70% of U.S. forces fails to destroy at least 300 U.S. mobile ICBMs.

[45]This represents warning time in an SLBM attack scenario. In an ICBM attack scenario, mobile forces would have perhaps 30 minutes escape time.

[46]Ten miles per hour is a conservative estimate. Mobile missiles may disperse much more quickly, resulting in a much larger required barrage area.

[47]The requirement for 200 warheads assumes 2 warheads per garrison. The 450 warhead requirement assumes 10 PSI ; the 1200 requirement assumes 30 PSI. Increased warning time and mobile missile dispersal speed would obviously increase the attacking Soviet warhead requirement.

Finally, the phased return of mobile ICBMs to main garrisons has an uncertain effect on the possibility of accidental or unintended conflict. This measure results in shorter lines of communications and may thus reduce the likelihood of miscommunication among forces and the likelihood of accidental or unauthorized conflict. Conversely, the increased vulnerability of mobile ICBM forces in garrison may lead to greater delegation of launch authority and increase the potential for accidental, unintended, or unauthorized conflict.

In sum, a phased return of a modest number of mobile ICBMs may be an appropriate confidence-building measure since it decreases threat perceptions. In addition, high attacking warhead requirements indicate little change in surprise attack incentives. Verification difficulties complicate this measure, although implementation over a period of several days or weeks may greatly reduce this problem. Finally, this measure appears unlikely to result in force asymmetries unless future force levels change considerably.

Strategic Submarines

In a crisis, the United States and Soviets would launch non-alert strategic submarines from ports to decrease their vulnerability to attack. Some SSBNs might also be positioned near opposing national command centers to increase the chances of success in a decapitating surprise attack. This section examines two strategic submarine-related CBMs: a return to port of ballistic missile carrying submarines alerted during the crisis and the establishment of "keep-out zones" near national command centers. The former requires the United States and Soviets to return to peacetime SSBN alert levels of 60% and 20%, respectively.

The return of alerted SSBNs[48] may significantly reduce the psychological threat of nuclear war and highlight enemy intentions. For example, the Soviets would view a U.S. decision to return alerted SSBNs to port as a significant change in the U.S. perception regarding the likelihood of conflict, particularly since this measure affects the vulnerability of the most robust leg of the U.S. nuclear triad. In short, this measure probably reduces the perception that nuclear conflict is likely, particularly from a Soviet perspective.

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[48]It is not appropriate to return all SSBNs to ports since this does not occur in peacetime. Thus, this measure does not decrease the number of surviving SSBN warheads below peacetime levels.

However, this measure may be unsuitable since verification of compliance is difficult. For example, submarines might be camouflaged in port, complicating verification procedures.[49] Failure to quickly detect cheating might permit an aggressor to disperse SSBNs just prior to a surprise attack. This may also increase surprise attack incentives.

In fact, consider the increased incentives for surprise attack with this measure when the Soviet Union disperses SSBN forces from ports simultaneously with a surprise attack. First, the attack would almost certainly destroy all U.S. SSBNs in port.[50] Second, this may limit U.S. retaliation against escaping Soviet SSBNs. For example, as the radius of uncertainty around escaping Soviet SSBNs doubles, the required megatonnage to destroy escaping SSBNs increases by a factor of four.[51] If Soviet SSBNs escape from three SSBN bases,[52] and the U.S. reaction time is 30 minutes, the U.S. barrage requirement is about 300 megatons (about 10% of its pre-attack megatonnage or about 20% of remaining megatonnage following a Soviet attack).[53] Thus, the Soviets might be able to destroy a large number of U.S. warheads with the use or loss of only a few warheads. The United States could similarly disperse SSBNs in a surprise attack plan and enter the first stages of a crisis with a greater chance of escalation dominance.

This measure may also not fully highlight enemy intentions since it only marginally affects military operations. For example, this measure does not greatly complicate war planning and, as demonstrated above, might actually mask preparations for a surprise attack.

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[49]On-site inspection procedures would greatly limit this concern.

[50]This depends on several variables, including Soviet weapons reliability and U.S. SSBN dispersal speed.

[51]In short, the required megatonnage increases by the square of the increase in the radius of uncertainty.

[52]*Soviet Military Power*, p. 33, and IISS, *The Military Balance*. SSBN speed here is assumed to be about 16 nautical miles per hour.

[53]This is based on calculations which assume 25 one-megaton warheads with underwater burst capabilities are required to destroy SSBNs within a 12.5 nautical mile radius. Donald C. Daniel and Philip D. Zelikow, "Superpower ASW Developments and the Survivability of Strategic Submarines," *The Journal of Strategic Studies* (London), Vol. 10, No. 1, March, 1987, p. 15.

Table 3

SLBM WARHEAD LEVELS POST-SURPRISE ATTACK[54]

	United States	Soviet Union
No Return to Port Submarines/Warheads	36/5632	75/3378
Return to Port Submarines/Warheads	22/3380	15/676

An exchange model may highlight changes in surprise attack incentives following the implementation of this measure.[55] Table 3 illustrates U.S. and Soviet post-surprise attack SSBN warhead levels with and without this potential confidence-building measure.

As Table 3 illustrates, this measure results in significant costs to Soviet and U.S. forces. However, the relative costs to the Soviets of this measure are far greater. This occurs since the measure requires a return to U.S. and Soviet peacetime alert rates of 60% and 20%, respectively. This low Soviet warhead survival rate may increase U.S. surprise attack incentives and decrease the suitability of this measure from a Soviet perspective.

Force asymmetries may also complicate the suitability of this measure from a U.S. perspective. Most significantly, U.S. force posture indicates a greater general dependence on SLBM warheads, particularly for a retaliatory attack.[56] It is unlikely that U.S. leaders would consider acceptable the increased vulnerability of the key leg of the U.S. triad without commensurate costs to the Soviets. Potential advances in Soviet anti-submarine warfare (ASW) efforts may also reduce the suitability of this measure. In addition, U.S. SLBM warheads perform specific military roles and their increased vulnerability may be unacceptable. For example, although about 22 U.S. SSBNs would survive a Soviet surprise attack, only about one-half would carry the longer range and

[54]Calculations in the return-to-port scenario are based entirely on the alerted share of aggregate SSBNs and SLBM warheads. Thus, the share of surviving warheads in the United States and Soviet cases is 60% and 20%, respectively. The composition and different capabilities of surviving SSBNs may slightly alter these estimates.

[55]Once again, this is intended as a relatively crude measure of the measure's costs and benefits A second measure, the aggressor's costs in incremental warheads of destroying a high percentage of the SSBN fleet, is inappropriate given SSBN invulnerability at sea.

[56]SLBMs constitute more than 50 percent of total U.S. strategic warheads. Conversely, SLBMs make up about 25 percent of total Soviet strategic warheads.

more accurate C-4 SLBM. The remainder carry the C-3 SLBM with a range of just over 4,000 kilometers.[57] Thus, only about one-half of surviving U.S. submarines would be able to perform key military missions requiring longer-range, more accurate weapons.

The Soviets may also reject this measure because of force asymmetries. As noted earlier, low Soviet alert rates greatly increase Soviet SSBN vulnerability. However, the Soviets may also reject this measure since it may limit options for SS-N-6 and SS-N-17 SLBMs carried on Yankee-class submarines.[58] In particular, the measure might force the Soviets to decrease the number of Yankee-class submarines in the Atlantic, limiting Soviet options for an attack against the U.S. national command authority should the crisis re-escalate.

However, the phased return of SSBNs to port may be an appropriate CBM. Phased return limits SSBN vulnerability and mitigates decreases in second strike warhead levels, as Figure 4 indicates. This may be useful in the early crisis termination phase when the likelihood of re-escalation is higher.

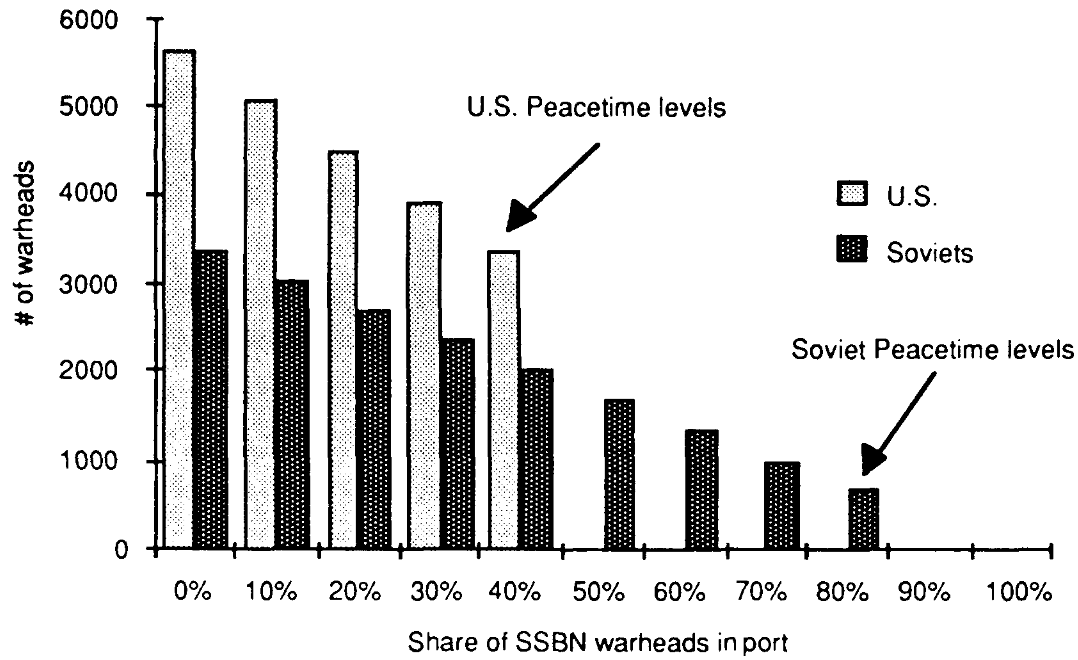

Fig.4—Phased return of SSBNs to ports

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[57]16 of the 36 SSBNs are equipped with the C-3. International Institute for Strategic Studies, *The Military Balance*, (London: 1988).

[58]SS-N-6s and SS-N-17s have ranges near 4,000 kilometers. International Institute for Strategic Studies, *The Military Balance* (London: 1988).

As Figure 4 indicates, the phased return of alerted SSBNs modestly affects SSBN vulnerability and second strike warhead levels in the early crisis termination phase. In later stages, higher levels of SSBNs and SLBM warheads are at risk; however, this occurs late in the crisis termination phase when the risk of crisis re-escalation or a surprise attack is probably reduced.

In addition, the phased return of SSBNs over a period of several days or weeks provides intelligence assets and observers[59] greater opportunities to detect non-compliance. This temporal increase greatly decreases the likelihood of successfully circumventing the CBM. For example, if the probability of successful circumvention is 80% each day, the probability of detection in a three-day de-escalation phase is about 50%. Over a 7 day period, the likelihood of escaping detection falls to near 20%. Longer periods further decrease the likelihood of successful cheating.

The effects of this measure on the likelihood of accidental conflict are uncertain and parallel changes in the mobile ICBM return-to-garrisons case. The potential for accidental war may decrease since lines of communication are shorter and therefore less susceptible to misinterpretation; however, this measure may also lead to increased delegation of launch authority and increase the likelihood of unauthorized conflict.

In sum, the return of alerted SSBNs to port may significantly reduce the psychological threat of nuclear war and highlight enemy intentions. In addition, this measure only modestly increases SSBN vulnerability in the early crisis termination stages and may be an appropriate CBM. However, verification problems and, more importantly, force asymmetries limit the suitability of this measure. In short, this measure may be suitable only in the later stages of crisis termination when the probability of conflict has been greatly reduced.

Establishing minimum distance requirements ("keep-out zones") from the National Command Authority and other time urgent targets may also be an appropriate CBM in a superpower crisis. In particular, keep-out zones for Soviet SSBNs, normally positioned along U.S. coasts for surprise attacks against time-urgent targets, may be appropriate. Keep-out zones may influence perceptions and signal a reduced chance of war; however, it fails many other CBM objectives. Most notably, this measure fails CBM verification criteria.

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[59]This might include observers from the United States, the Soviet Union, or a designated third country.

The establishment of keep-out zones near NCAs may reduce the threat of attack and may also provide insight into intentions. For example, the positioning of Soviet SSBNs near U.S. coasts in a crisis would certainly increase concerns of a Soviet decapitating or short-warning attack against U.S. nuclear forces. Establishing Soviet SSBN keep-out zones provides modest increases in warning time,[60] but more importantly reduces U.S. anxiety about a Soviet attack.[61] Keep-out zones in waters near Moscow would also undoubtedly allay Soviet fears.

However, this measure fails to satisfy CBM verification objectives. For example, in a 1,000-mile radius keep-out zone near Washington, the U.S. patrol requirement to detect Soviet cheating is a nearly one and one-half million square mile area.[62] Although U.S. ASW forces are capable and well distributed, it is unclear whether they could successfully patrol large areas with high confidence levels.[63] The Soviets could also likely not successfully patrol keep-out zones.[64]

Keep-out zones may satisfy other CBM requirements by decreasing surprise attack incentives. Specifically, keep-out zones may increase defending warhead and command authority survival rates by increasing warning time. Figure 5 illustrates likely U.S. targets (Washington and SAC bomber bases) and flight times for Soviet Atlantic SLBM patrols under two keep-out zone regimes.[65] Figure 5 also illustrates the flight times from U.S. SSBNs near the Soviet Union.

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[60]Perhaps an increase of up to 5 minutes, depending on keep-out area size.

[61]Although the U.S. NCA is in theory not dependent upon tactical warning, reducing the threat against the NCA may be a useful CBM. The U.S. leadership might rest easier knowing that the warning time in Soviet SSBN attack scenarios had increased, albeit modestly.

[62]Total area is calculated by assuming the area is a semi-circle of radius 1,000 miles.

[63]Detection of Soviet SSBNs which have surreptitiously moved into the keep-out area might be hampered by oceanic conditions, such as the structure and condition of the ocean bottom, temperature, salinity and pressure differences, and other factors. Donald C. Daniel and Philip D. Zelikow, "Superpower ASW Developments and the Survivability of Strategic Submarines," *The Journal of Strategic Studies* (London), Vol. 10, No. 1, March, 1987, pp. 6–8.

[64]The size of these U.S. SSBN keep-out zones would be considerably smaller, yet remain a considerable task for Soviet patrol boats and aircraft.

[65]Figure 4 illustrates average flight times to SAC bases, most of which are located in the middle west. Other SAC bases, such as Dyess in Texas, might have less warning time than this figure indicates. A keep-out zone in the Pacific would result in approximately the same flight times to SAC bases as the Atlantic zone.

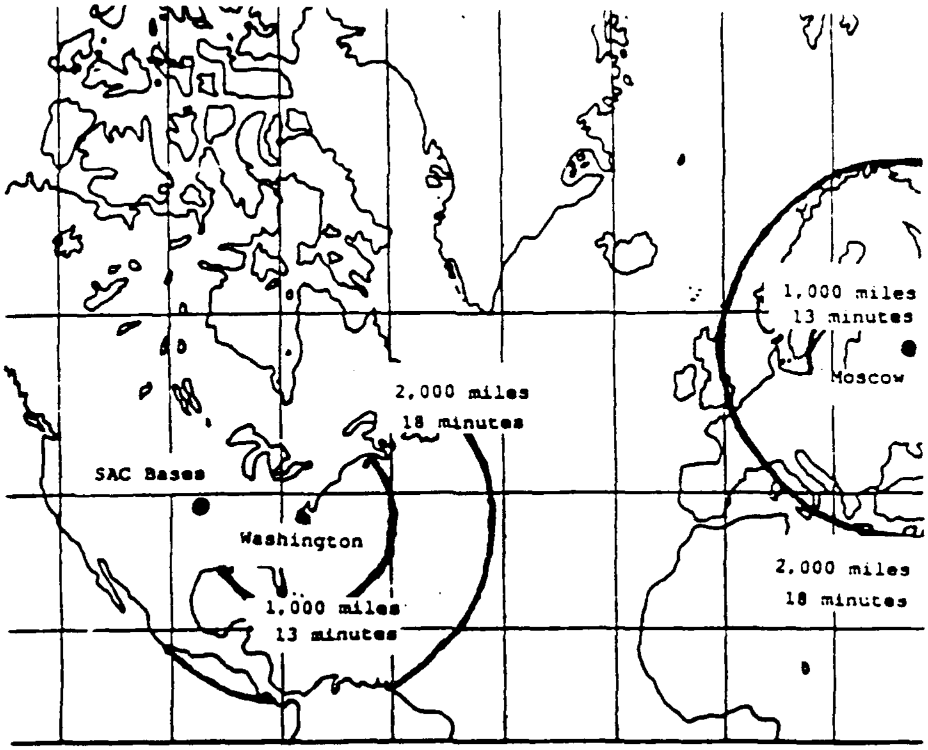

Fig. 5—SLBM flight time to NCAs and SAC bases

Figure 5 illustrates the modest increases in flight and warning times resulting from this measure.[66] For example, a 500-mi.: radius keep-out zone outside Washington (not illustrated) provides approximately 10 and 14 minutes[67] warning time for the leadership in Washington and for most SAC bases, respectively. A 1,000-mile keep-out zone provides about 13 and 16 to 17 minute warning time, respectively. A 2,000-mile radius keep-out zone increases this another 2 minutes. Thus, keep-out zones modestly increase warning time, likely increase surviving warhead levels, and may reduce surprise attack incentives.

This measure may create force structure asymmetries. From a Soviet perspective, this measure reduces Soviet political and military leverage, particularly in affecting Atlantic operations. Moscow's geographic location limits the effect of this measure on

[66]Especially warheads on bomber and SSBN forces which escape the attack.

[67]The limited number of Soviet SLBM warheads on Yankee-class SSBNs make it likely that a Soviet SLBM attack would be launched in concert with ICBMs from the Soviet Union's homeland. Thus, the United States would have significantly more warning time to coordinate its retaliatory attack and post-attack operations.

U.S. operations. In addition, since the Soviets normally operate SSBN patrols only 1,000 miles from Washington, they might not accept crisis-designated patrol zones which are more stringent than those used in peacetime.

The United States might also hesitate to initiate this measure for several reasons. First, keep-out zones greatly restrict U.S. SSBNs operations and may negatively affect U.S. maritime strategy. In particular, difficulty in distinguishing between SSBNs and nuclear powered attack submarines (SSNs) may require a withdrawal of attack submarines from keep-out zones, further complicating war missions. Second, it may effectively reduce U.S. political guarantees to allies near Soviet borders.

Finally, this measure does not create asymmetries in a crisis re-escalation scenario. In particular, a slow crisis re-escalation permits both the United States and Soviets to redeploy forces near NCAs and to be able to accomplish specific war objectives. For example, in a 2,000-mile radius keep-out zone, the Soviets could reposition SSBNs several hundred miles closer to Washington in less than 24 hours, quickly regaining their political and military threats against the U.S. capital. U.S. SSBNs could also quickly re-establish their wartime mission preparations.

Keep-out zones almost certainly help avoid accidental or unintended conflict. In particular, SSBN keep-out zones provide additional warning time for nuclear forces should conflict occur and reduce pressures to launch on warning. This modest increase in reaction time decreases the chances of misinterpreting benign actions and reduces the potential for accidental conflict.

In sum, the establishment of SSBN keep-out zones looks like an unsatisfactory confidence-building measure for several reasons.[68] First, verification appears extremely difficult. Second, the measure may result in asymmetric costs from both U.S. and Soviet perspectives. From a U.S. perspective, it restricts SSBN and SSN operations near time-critical and other Soviet targets. From a Soviet perspective, this measure limits important Atlantic SSBN operations and perhaps most importantly, decreases the political leverage of deploying Soviet SSBNs near time-urgent U.S. targets. In short, although this measure provides modest psychological benefits, particularly from an American perspective and also marginally increases warning time for leadership and other time-urgent assets, it appears unsatisfactory in building confidence.

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[68]Keep-in zones, discussed extensively in Alan Vick and James A. Thomson, *The Military Significance of Restrictions on Strategic Nuclear Force Operations*, The RAND Corporation, N-2113-FF, 1984, pp. 21–26, also seem an unlikely CBM for many of the same reasons keep-out zones would likely be unacceptable.

Strategic Bombers

In the early stages of a crisis, the alert rates of strategic bombers and tankers would be increased—in a more advanced crisis, bombers and tankers might be dispersed to remote staging bases. This section examines two potential strategic bomber related CBMs: a return of strategic bomber forces to main operating bases (MOBs) and a decrease in bomber alert rates.

Strategic bomber return to MOBs indicates a general decrease in the perception regarding the likelihood of nuclear war. For example, potential adversaries in a terminating crisis might view this measure in favorable terms, although it increases the vulnerability of bomber and tanker forces. This increase in vulnerability reflects the perception that conflict is improbable and that retaliatory strategic bomber warheads are unlikely to be required. However, this measure may not provide insight into intentions. In particular, bombers may be dispersed from MOBs in conjunction with a surprise attack, masking surprise attack incentives.

It is unclear whether this measure accomplishes CBM verification objectives, although it appears likely that NTMs are capable of assessing compliance with this measure. Deliberate cheating may occur, particularly in a surprise attack scenario, although the gains from this action may be limited. For example, an aggressor might flush bombers to staging bases concurrently with a surprise attack; however, as this section explains shortly, the decreases in defending bomber force vulnerability following the implementation of this measure are modest.

Surprise attack incentives may increase since this measure increases bomber and tanker vulnerability and decreases a defender's second strike warhead inventory. Exchange model calculations which estimate second strike warheads provide insight into changes in surprise attack incentives with and without this measure.

Figure 6 illustrates U.S.[69] post-attack bomber and bomber warhead levels with bombers dispersed and bombers returning to MOBs, as required in this measure. The

[69]The U.S. strategic bomber force includes 180 B-52G/H, 97 B-1B, and 55 FB-111A aircraft. For the purposes of this analysis (and since they are not normally included in strategic bomber totals), I have excluded FB-111A aircraft. KC-135 and KC-10 aircraft provide refueling. U.S. strategic bombers are located in peacetime at 16 main operating bases in the continental U.S. See "The Air Force Almanac," issue in *Air Force* for details on peacetime U.S. deployment of strategic bombers. A 17th main operating base is located at Anderson AFB in Guam. Most active tankers assigned to SAC are collocated at these 17 bases, although SAC deploys tankers at eight additional bases. No active tankers are collocated with the 320th Bombardment Wing at Mather AFB, California. "The Air Force Almanac," *Air Force*, May, 1987, p. 158. Guard and Reserve

calculations assume that bomber alert levels remain identical to alert levels at main operating and staging bases prior to the measure's implementation and that the number of aircraft on heightened levels of strip alert remains unchanged.[70]

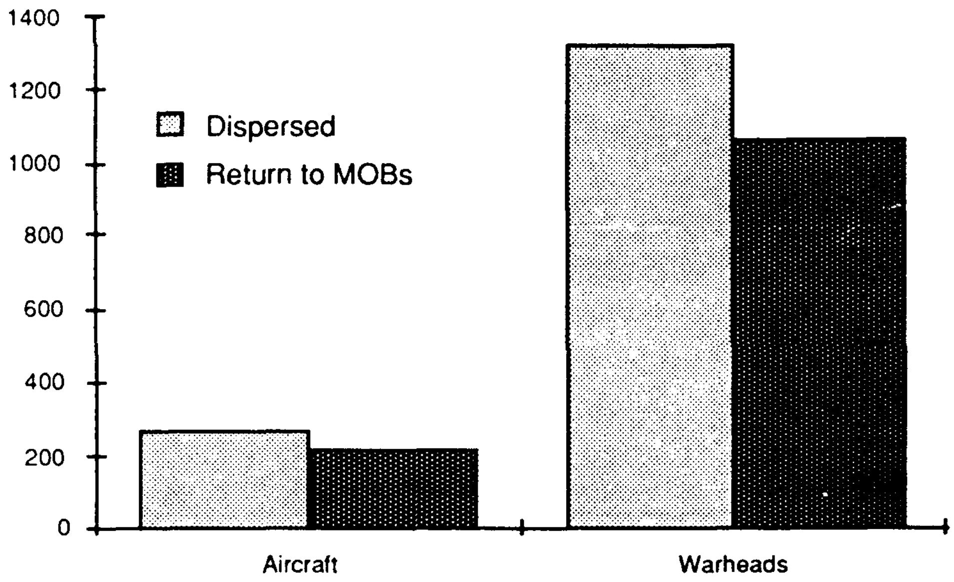

Fig. 6—Surviving U.S. strategic bombers and warheads—return to Main Operating Bases

As Figure 6 indicates, the return of U.S. strategic bombers to MOBs entails a modest cost measured in surviving bombers or warheads. In a Soviet attack on dispersed forces, surviving U.S. bomber and warhead levels total about 230 and 1300, respectively. After a return to MOBs, the number of U.S.bombers and warheads falls further to slightly more than 200 and about 1050, respectively, representing an additional approximate 10% loss.

Figure 7 illustrates second strike Soviet bombers and bomber warheads[71] with and without this measure. It indicates a more modest absolute Soviet incremental loss,

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forces are also assigned to SAC at other bases. As noted previously, the number of staging bases may number between 50 and 80.

[70]See the Appendix for more details.

[71]The Soviet strategic bomber force includes 140 Bear B, C, G, and H variants and 20 Bison aircraft. IISS, *The Military Balance*. Bison and Badger variants provide refueling. The number of Soviet Bear and Bison MOBs and the number of staging bases are estimates. Please see the Appendix for more information on Soviet forces and exchange calculations.

although the relative loss is greater than that of the U.S. The total Soviet warhead loss is less than 100; this represents an incremental loss of about 15%.

Figures 6 and 7 illustrate the modest increases in bomber vulnerability associated with this measure. These modest increases appear unlikely to increase surprise attack incentives, and the return of bombers to MOBs may serve as a useful CBM.

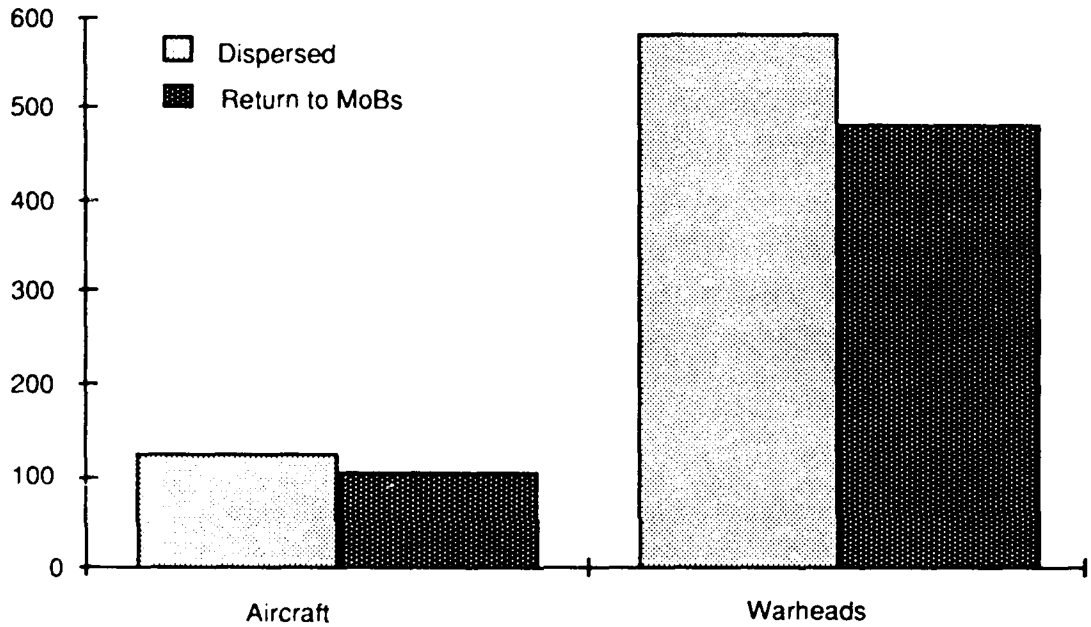

Fig.7—Surviving Soviet strategic bombers and warheads—return to Main Operating Bases

A second useful measure of changes associated with bomber return to main operating bases is the cost in attacking warheads required to destroy a large percentage[72] of the bomber force with and without this measure. For example, the Soviets or the United States might attempt to destroy escaping bombers with a barrage attack. In this case, the measure reduces greatly the required number of attacking warheads.[73] For example, a Soviet barrage attack on 17 U.S. MOBs requires about 6,800 warheads. A similar attack on dispersed forces at main and staging bases requires almost 16,000 warheads.[74] A U.S. barrage of Soviet bases also requires high numbers of attacking

[72]Greater than 95%.

[73]A barrage attack might be the best way to destroy a large number of alert bombers, although the Soviets might rely equally on air defenses to destroy incoming U.S. bombers.

[74]This figure represents a number greater than the Soviet strategic arsenal.

warheads, although the requirement against dispersed forces is greatly increased. The U.S. warhead requirement against non-dispersed and dispersed forces is approximately 11,500 and 20,000 warheads, respectively.[75] In sum, this measure decreases the number of attacking warheads required to destroy a large percentage of strategic bombers. However, barrage requirements remain high with this measure and it is doubtful that the measure changes surprise attack incentives significantly.

This measure may also result in asymmetric costs and benefits, particularly unfavorable from a U.S. perspective, and thus may be unsuitable as a confidence-building measure. Most importantly, bombers carry nearly one-third of U.S. strategic warheads and would probably contribute about 20 to 25 percent of retaliatory warheads following a surprise Soviet attack.[76] Soviet strategic bombers carry only about five percent of the Soviet second strike arsenal.[77] Rapid bomber dispersal to staging bases in crisis re-escalation likely minimizes these asymmetric costs.

This measure has an uncertain effect on the possibility of accidental or unintended conflict similar to the return of mobile ICBMs and SSBNs to main garrisons and ports, respectively. As in the previous cases, shorter lines of communications would reduce the likelihood of accidental or intended conflict, although increased bomber vulnerability may lead to increased delegation of launch authority and the increased likelihood of unauthorized conflict.

In sum, the return of dispersed bombers to MOBs may indeed decrease the perceived threat of attack, although it results in modestly asymmetric costs favoring the Soviet Union. To mitigate this asymmetry and limit vulnerability, the United States might consider a phased return of aircraft. A phased return of perhaps only a few aircraft in the early stages could continue only as the Soviets showed good faith in standing-down other forces. In short, the return of bombers to main operating bases largely satisfies CBM and national objectives and appears to be a suitable CBM.

A second potential strategic bomber-related CBM is a decrease in bomber alert rates. This measure requires the United States and Soviets to reduce crisis-generated bomber alert rates (probably about 80%) to normal peacetime rates of about 40% and 10%, respectively. This measure would also require the termination of airborne alert.

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[75]Smaller U.S. warhead yields account for these differences in attacking warhead requirements.

[76]Joseph E. Nation, *Force Stand-down and Crisis Termination*, The RAND Corporation P-7292-RGS, 1986, p. 31.

[77]International Institute for Strategic Studies, *The Military Balance* (London: 1988).

Decreasing alert rates for strategic aircraft may decrease the perception that war is probable; however, this does not necessarily highlight intentions or decrease the military threat in a nuclear crisis. For example, this decrease in alert rates does not prevent non-alert bombers from participation in surprise attacks or war preparations. In fact, apparent decreases in alert rates may permit needed maintenance and increase capabilities for a surprise attack. Moreover, this measure appears difficult to verify. U.S. and Soviet NTMs might verify the return of aircraft from active runways to hangars, although this might not appreciably affect scramble time. In short, assuring compliance with reduced alert rates may prove difficult.

This measure may also increase surprise attack incentives, as demonstrated below. These calculations assume initial 80% crisis alert rates; this potential CBM reduces these rates to 40% and 10% for U.S. and Soviet strategic bombers, respectively. Figure 8 illustrates surviving U.S. bomber warheads following a surprise Soviet attack with and without this measure.

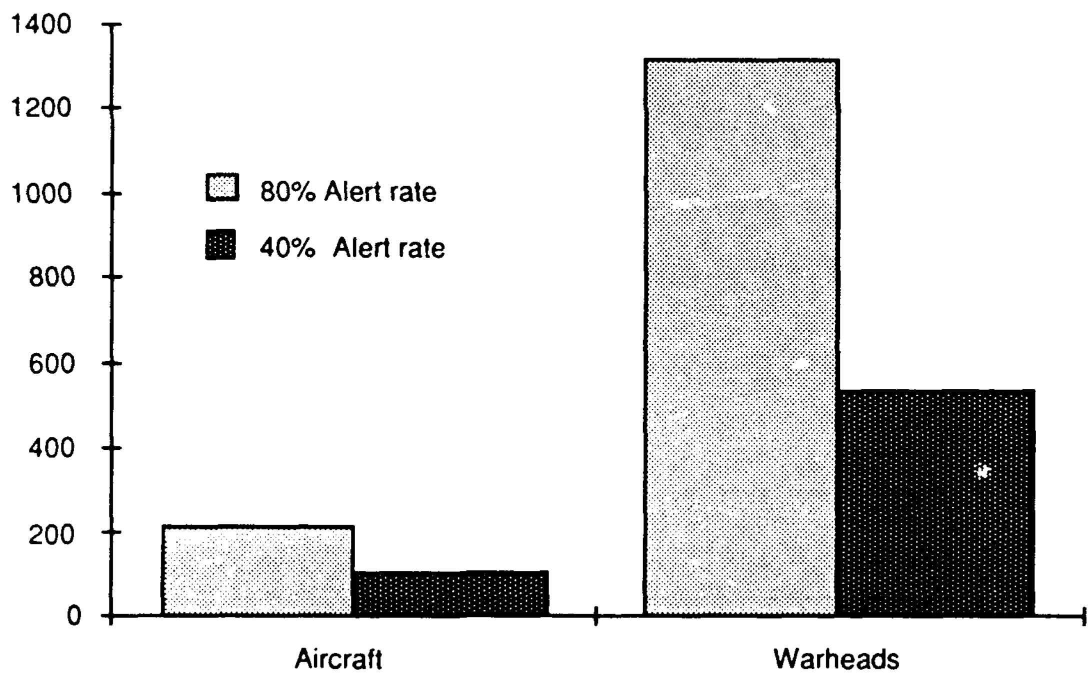

Fig. 8—Surviving U.S. strategic bombers and warheads—decrease in alert rates

Figure 8 illustrates the high costs to the United States and may correspondingly represent large changes in Soviet surprise attack incentives associated with this measure.

As Figure 8 illustrates, the number of surviving U.S. bombers and bomber warheads decreases by about 50%.[78]

A decrease in the Soviet bomber alert rate appears less significant in absolute terms, although it parallels the U.S. case in relative terms. The Soviet strategic bomber force accounts for only about five percent of Soviet strategic warheads. This measure thus only slightly affects aggregate Soviet second strike warhead levels and U.S. surprise attack incentives. In short, this measure may result in modest asymmetries resulting from a greater U.S. dependence on strategic bomber forces and low Soviet bomber alert rates.

In sum, the phased return of strategic bombers to main operating bases is probably an appropriate CBM, particularly given its modest effect on bomber vulnerability. This can be further mitigated by a phased return of bombers. Conversely, a decrease in alert rates seems inappropriate given potential changes in surprise attack incentives, verification difficulties, and the highly asymmetric costs to the United States Neither measure would significantly affect the potential for accidental or unintended conflict.

[78]The number of U.S. warheads is reduced by more than 50% since a disproportionate share of destroyed bombers carry up to 20 air-launched cruise missiles (ALCMs). Other destroyed bombers are assumed to carry only one warhead.

VI. CBMs IN A FUTURE CONTEXT

CBMs UNDER THE START FRAMEWORK

Several of the potential CBMs outlined earlier appear likely to contribute to crisis de-escalation. However, the future suitability of these measures in alternative futures, including force structures under the START framework, is uncertain. This section briefly examines the suitability and effectiveness of de-escalatory strategic CBMs in this future context.

The START framework establishes significantly lower strategic nuclear delivery vehicle and warhead levels. In general, it establishes a limit of 1,600 strategic nuclear platforms and 6,000 strategic nuclear warheads.[1] However, the framework does not establish future force composition. Table 4 summarizes three notional force structures under the START framework.[2] The first scenario represents proportional reductions across ICBM, SLBM, and strategic bomber categories. The second represents highly mobile and survivable forces. The third scenario represents highly accurate forces.

INTEGRATED OPERATIONS

The utility of previously outlined integrated force CBMs appears to change only marginally within the START framework. The suitability of grounding supplemental airborne command posts may decrease slightly. The suitability of termination of interference with NTMs appears to increase. The START framework appears unlikely to affect measures to return leadership to national capitals or to terminate civil defense activities.[3]

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[1]The number of actual warheads allowed is near 8,500. Strategic bomber warhead counting rules account for this disparity.

[2]These three scenarios are developed more fully in Michael M. May, George F. Bing, and John D. Steinbruner, "Strategic Arsenals After START: The Implications of Deep Cuts," *International Security*, Vol. 13, No. 1 (Summer) 1988, pp. 90–133. Table 4 differs slightly from that found in the May, et. al article. Table 4 estimates slightly higher numbers of U.S. SSBN platforms in cases two and three. It illustrates a slightly lower number of U.S. strategic bombers. The Soviet force section corresponds to the May, et. al article except that it reduces the number of Blackjack bombers to 59 in the third case. However, the basic force structures between the tables remain similar.

[3]The final integrated force measure, the return of early warning sensors to intelligence gathering roles, is currently unsuitable and is not examined here. It is unlikely that this will change in the future.

Table 4

U.S. AND SOVIET FORCES UNDER THE START FRAMEWORK

United States	Proportional Forces		Mobile Forces		Accurate Forces	
	Launchers	Warheads	Launchers	Warheads	Launchers	Warheads
ICBMs	250 MM 2	250	1000 SICM	1000	50 MX	500
	250 MM 3	750			500 SICM	500
ICBM Total	500	1000	1000	1000	550	1000
SSBNs	144 C-3	1440	378 C-4	3024	378 D-5	3024
	192 C-4	1536				
SSBN Total	336	2976	378	3024	378	3024
Bombers	97 B-1B	1940[a]	97 B-1B	1940	97 B-1B	1940
Total	933	5916	1475	5964	1025	5964

Soviet Union	Proportional Forces		Mobile Forces		Accurate Forces	
	Launchers	Warheads	Launchers	Warheads	Launchers	Warheads
ICBMs	200 SS-11	200	180 SS-19	1080	100 SS-18	1000
	100 SS-17	400	990 SS-25	990	1000 SS-25	1000
	156 SS-18	1560				
	180 SS-19	1080				
	90 SS-25	90				
ICBM Total	726	3330	1170	2070	1100	2000
SSBNs	160 SS-N-18	1120	80 SS-N-20	640	80 SS-N-20	640
	80 SS-N-20	640	272 SS-N-23	2176	272 SS-N-23	2176
	80 SS-N-23	640				
SSBN Total	320	2400	352	2816	352	2816
Bombers	66 Bear H	264	55 Blackhack	1100[a]	59 Blackjack	1180
Total	1112	5994	1577	5986	1512	5996

[a]Assumes 20 warhead counting rule for all air-launched cruise missile- (ALCM) equipped bombers.

The grounding of supplemental airborne command posts in future crises may be a less appropriate CBM. As outlined earlier, U.S. and Soviet airborne command posts provide communications links to nuclear forces, particularly to strategic bombers and

submarines. The United States relies much more heavily on airborne command assets than do the Soviets. Two factors may reduce the suitability of this measure in future scenarios. First, the introduction of mobile ICBM launchers and the removal of many or all silo-based ICBM launchers, illustrated in scenarios two and three, may increase the importance of airborne command posts. In these scenarios, primary communication with all (or virtually all if some silo-based ICBMs are retained) nuclear forces would depend heavily on the survivability of airborne command posts. Both the United States and the Soviets might be less willing to increase the vulnerability of these assets given their increased importance. This willingness depends on the number of mobile ICBM forces and aggregate mobile force share of strategic warheads.

Second, reductions in *absolute* numbers of second strike warheads in the START framework may reduce the suitability of this measure. For example, the number of second strike warheads in START scenarios is roughly one-half of second strike warhead levels today. These lower levels may increase the *perception* that the importance of second strike warheads has grown. Accordingly, jeopardizing the ability to use these warheads, including essential communications links, may be viewed less favorably.[4]

The termination of interference with NTMs may be viewed as a critical CBM under the START framework scenarios. Under current force structure, this measure provides insight into intentions, increases the transparency of military operations, and may reduce the incentives for surprise attack. This measure satisfies these objectives in future scenarios—moreover, the potential gains from cheating may increase the importance of this measure.

NTMs in crises verify the implementation of de-escalatory measures and limit potential asymmetries resulting from cheating. At high warhead levels, the importance of the NTM role is reduced since limited cheating does not appreciably affect second strike warhead levels or surprise attack incentives. However, reduced warhead levels, as indicated in the START framework, increase the importance of detecting cheating. The importance of detection increases since successful, undetected non-compliance, even at relatively small levels, may appreciably affect second strike warhead levels. Reducing opportunities to successfully cheat, particularly through increased NTM monitoring, may accordingly increase in importance.

[4]Second strike warheads in future scenarios would probably be of no greater relative use than they would be under current force structure; however, today's high second strike levels probably increase the perception that some warheads could be put at risk without jeopardizing national objectives.

STRATEGIC NUCLEAR FORCES

The suitability of strategic nuclear force-related CBMs outlined may also change modestly under the START framework. The introduction of a relatively high number of mobile to silo-based ICBMs may increase the suitability of a phased mobile ICBM return to main garrisons, while reductions in the number of SSBN- and strategic bomber-related platforms may reduce the suitability of SSBN- and strategic bomber-related CBMs.

The introduction of a relatively high mobile to silo-based ICBM ratio, as outlined in scenario two, greatly increases the feasibility of a phased mobile ICBM return to garrisons as a confidence-building measure.[5] This occurs since increased mobile ICBM forces result in higher second strike warhead levels and probably decrease surprise attack incentives. For example, in scenario two (1000 mobile ICBMs), a Soviet attack on U.S. ICBMs after a 50% return to garrison requires about 100 warheads; however, 500 dispersed mobile ICBMs survive.[6] A Soviet attack on U.S. ICBMs in scenario three (50 MX and 500 mobile ICBMs; a lower mobile- to silo-missile ratio) after a 50% mobile ICBM return to garrison requires about 150 Soviet warheads.[7] In this case, however, only 250 dispersed mobile ICBMs survive. Thus, a high U.S. mobile to silo-based ICBM share increases second strike warhead levels and may further decrease surprise attack incentives. A high Soviet mobile to silo-based ICBM share similarly increases the suitability of mobile missile return to garrison.

The return of SSBNs to main ports[8] may become less feasible under the START framework for several reasons, particularly from a U.S. perspective. START will likely limit the total number of U.S. SLBM warheads to about 3,000 and decrease the total number of U.S. SSBN platforms to 21. (This represents a decrease from 36 today.) A return to peacetime U.S. SSBN alert rates of 60% during the crisis would require the return to port of 8 SSBNs; thus, only 13 U.S. SSBNs would survive a Soviet surprise attack.[9] A phased return of SSBNs results in between 14 and 20 surviving U.S. SSBNs.

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[5]The introduction of other mobile ICBM forces, such as the rail-mobile MX, also increases the feasibility of this measure since they increase surviving second strike warhead levels.

[6]This includes 100 warheads targeted on 50 mobile missile garrisons. The attacking-to-destroyed warhead ratio is .2.

[7]This includes 100 and 50 warheads targeted on 50 MX and 25 mobile missile garrisons, respectively. The attacking to destroyed warhead ratio is again .2.

[8]Submarine keep-out zone CBMs appear unlikely to become more feasible in the future and are not examined.

[9]22 SSBNs would survive a surprise Soviet attack if this measure were implemented with today's force levels.

This small absolute number of surviving SSBN platforms may concern U.S. planners for two reasons. First, planners may consider this number precarious given possible advances in Soviet ASW and U.S. reliance on a small number of platforms. Second, planners may be concerned that this low number of surviving U.S. SSBNs, particularly C-3-equipped SSBNs, may severely restrict missions which require highly accurate SLBMs.

This measure may cause less concern for the Soviets given likely SSBN force structures under the START framework. For example, continued deployment of a high number of SSBN platforms results in higher absolute numbers of surviving Soviet SSBNs. This high number of surviving Soviet SSBNs would be less likely to be affected by U.S. ASW efforts.

Finally, the feasibility of the phased return of strategic bombers to main operating bases as a CBM may decrease under the START framework. (The suitability of reducing strategic bomber alert rates, at least in early crisis termination stages, will continue to be unfavorable in the future.) This decrease results from a significant fall in the absolute number of strategic aircraft and the likely perception that the vulnerability of these aircraft should be minimized. For example, the implementation of this measure today would reduce the absolute number of U.S. bomber aircraft surviving a surprise Soviet attack to 158.[10] Under the START framework, this falls to about 56. In short, the START framework greatly reduces the absolute number of surviving strategic bombers. Resistance to increasing the vulnerability of this small number of aircraft may make this measure less palatable.

The suitability of returning bombers to main operating bases in the future may also decrease from a Soviet perspective, particularly if the Soviets reduce their number of strategic bombers but increase the bomber warhead share as outlined in scenarios two and three. In these cases, the Soviets might also be reluctant to increase the vulnerability of bombers for reasons which parallel U.S. concerns.

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[10]This assumes an 80% alert rate at all bases. For further details, please refer to the Appendix.

VII. DISCUSSION

This paper has evaluated the utility of specific confidence-building de-escalatory measures and has given special attention to the evaluation of measures which place restrictions on or establish procedures for strategic forces.

The results have been mixed, although some measures appear more promising than others. Potentially useful confidence-building measures largely satisfy defined criteria and include the phased return of strategic nuclear forces to peacetime bases and operations, the termination of interference with communications and NTMs, and the termination of civil defense preparations. Less-promising CBMs include the standing down of supplemental early warning systems, the establishment of SSBN keep-out zones, and decreases in bomber alert rates. The establishment of SSBN keep-out zones and reduction in bomber rates are difficult to verify, while the the standing-down of early warning systems provides little benefit at potentially large costs. Table 5 lists CBM objectives and the suitability of the CBMs examined in this paper.

Particular confidence-building measures (CBMs) may be most useful in building superpower confidence at specific points in the crisis termination phase. For example, a decrease in strategic bomber alert rates may provide some decrease in the perception of the likelihood of war, but its potential costs, particularly in increasing bomber vulnerability, may limit its utility and implementation to the final crisis stages when the risks of re-escalation and surprise attack are lower. Conversely, the phased return of strategic bombers to main operating bases carries far lower costs and might be considered earlier in a terminating crisis. (The Soviets might support each of these measures earlier in a crisis given their relatively modest dependence on strategic bombers.) Figure 9 suggests a potential de-escalatory CBM ladder.

The termination of interference with communications and National Technical Means of verification and data collection is perhaps the most likely CBM to surface in the early crisis termination phase. This measure, perhaps declared or exercised unilaterally, would likely follow declaratory and other non-operational CBMs. This measure increases the value of various other CBMs, including observation, inspection, and the exchange of information and enables intelligence assets to increase the transparency of ambiguous military operations.

Table 5

DE-ESCALATORY STRATEGIC CBMs AND OBJECTIVES

CBM Measures	Insight/perceptions	Verification	Complicate war path	Surprise attack incentives	Create asymmetries	Accidental war
Integrated Operations						
Airborne command posts	1	1	1	1	0	1
Early warning	0	0	1	0	1	2
NTMs	2	2	2	2	2	2
Civil defense	2	1	1	1	0	0
Strategic Nuclear Forces						
Mobile ICBM	1	1	1	0	0	1
SSBN return to port	1	1	0	0	0	1
SSBN keep-out zones	1	1	1	0	0	2
Bomber return to MOB	1	2	0	0	0	1
Bomber alert rates	1	0	1	1	0	0

(Column group heading: CBM Objectives)

0=does not satisfy objective
1=marginally satisfies objective
2=fully satisfies objective

The termination of interference with communications and National Technical Means of verification and data collection is perhaps the most likely CBM to surface in the early crisis termination phase. This measure, perhaps declared or exercised unilaterally, would likely follow declaratory and other non-operational CBMs. This measure increases the value of various other CBMs, including observation, inspection, and the exchange of information and enables intelligence assets to increase the transparency of ambiguous military operations.

The return of supplemental early warning to intelligence-gathering systems and the standing-down of supplemental airborne command posts are likely to be undertaken in the final crisis termination phase. The early implementation of the former measure is probably inappropriate since it minimizes the likelihood of accidental conflict resulting from early warning system malfunction. Asymmetries in airborne command post mission

importance, combined with its relatively minor contribution to assessing threat perceptions, account for its position near the end of the crisis termination phase.

Crisis Termination Phase Begins
Termination of interference with communications and NTMs
Phased return of strategic bombers to MOBs
Phased return of mobile ICBMs to garrisons
Phased return of SSBNs to port
Return of leadership to national capitals
Termination of civil defense measures
Return of remaining mobile ICBMs to garrisons
Return of remaining strategic bombers to MOBs
Return of remaining alerted SSBNs to ports
Decrease in strategic bomber and tanker alert rates
Stand-down of supplemental airborne command posts
Return of supplemental early warning systems to intelligence-gathering
Crisis Termination Phase Ends

Fig. 9—A de-escalatory CBM ladder

The phased return of some mobile ICBMs, SSBNs, and strategic bombers may be undertaken relatively early in the crisis termination stage. As discussed earlier, the return of a moderate number of platforms in each category results in minimal costs in terms of surviving warhead levels and consequently does not appreciably affect surprise attack incentives. The specific sequence is predicated primarily on the relative U.S.dependence, measured in second strike warheads, on each leg of the triad.

In the latter stages of the crisis, it is probably appropriate to decrease strategic bomber and tanker alert rates. The position of this CBM late in a crisis is based on the high vulnerability of U.S. strategic bombers not on alert, asymmetries between U.S. and Soviet bomber forces, and difficulties in verification.

The remaining CBMs are admittedly arranged somewhat arbitrarily. For example, the immediate return of leadership to national capitals early on in a crisis may be appropriate under certain situations. In fact, because the U.S. President would likely vacate the White House only in a serious crisis, this measure might be appropriate and

provide a very important political signal in the early stages of a terminating crisis. However, this measure may be appropriate only after some minimum show of good faith, such as the implementation of some strategic force operational restrictions. In any event, this measure would almost certainly occur before the termination of civil defense efforts.

THE ORIGIN AND FORM OF CBMs

Regardless of the suitability and order of potential CBMs, the origins of de-escalatory CBMs remains a difficult question. For example, it is unclear whether CBMs should be (or can be) negotiated during peacetime or during the evolution of a crisis. Negotiating peacetime CBMs may prove to be difficult for two reasons. First, a peacetime environment lacks the urgency of crisis negotiations and the United States and Soviets may consequently be more reluctant to demonstrate flexibility. Informal crisis negotiations involving more flexible, less intransigent superpowers, may be more productive.

Second, specific CBMs may be possible only in crisis situations since changing force structures may limit the suitability of CBMs. For example, it is uncertain that either the United States or Soviets would currently agree to CBMs which restrict bomber operations. This stems from uncertainties about future strategic bomber force structure, future technologies, unforeseen changes in bomber operations and concerns that these factors may create or exacerbate asymmetries.

The precise form of CBMs also remains uncertain. For example, it is unclear whether CBMs are more likely to occur as unilateral or bilateral measures. In a very serious crisis, mutual agreement on CBM specifics may be difficult to achieve given the levels of mistrust and hostilities and the difficulty in arranging formal negotiations. Unilateral measures may be more likely to occur. Declaratory CBMs would likely occur early, although some of the measures restricting military operations outlined in this paper, such as voluntary SSBN keep-out zones, might be announced unilaterally.

In conclusion, several of the de-escalatory CBMs outlined in this paper satisfy CBM objectives. In particular, the phased return of nuclear forces modestly increases vulnerability, but is offset by a decreased threat perception and added insight into intentions. Integrated force-related CBMs, including the termination of civil defense measures and the termination of interference with NTMs also satisfy CBM objectives. In particular, some integrated force CBMs may reduce the potential for accidental nuclear conflict.

The suitability of these confidence-building measures may change marginally in the future, particularly under the START framework. START guidelines and future superpower nuclear force structure appear to increase the suitability of two CBMs. These include the termination of interference with national technical means of intelligence and the phased return of mobile ICBMs to main garrisons. However, these guidelines may decrease the suitability of several other potential CBMs. These include the phased return of strategic bombers and submarines to main operating bases and ports, respectively, and the grounding of supplemental airborne command posts. Finally, although these CBMs appear promising in a superpower crisis, the nature and form of CBMs remain uncertain. Despite the uncertainty surrounding these issues, de-escalatory strategic CBMs appear useful in crisis termination.

Appendix
EXCHANGE CALCULATIONS

This appendix describes several exchange calculations outlined in the text. It explains assumptions used to estimate second strike strategic ICBM and bomber warhead levels following surprise nuclear attacks during crises. (Surviving second strike SLBM warhead levels are straightforward and explained in the text.) These calculations include second strike warhead levels with and without the implementation of specific confidence-building measures. The calculations estimate second strike warhead levels under current and likely future force structures. This appendix also outlines the assumptions used to estimate barrage requirements against dispersed mobile ICBM and bomber forces.

BARRAGE REQUIREMENT AGAINST MOBILE ICBMs AND STRATEGIC BOMBERS

Mobile ICBMs

Exchange calculations described in the text assume that the U.S. mobile ICBM force consists of 1,000 mobile missiles deployed evenly at 100 main garrisons on 12,000 square miles of government military reservations.[1] U.S. mobile missiles are assumed to be capable of withstanding between 10 and 30 PSI overpressure. Mobile forces are assumed not to disperse unless in a crisis. In a crisis, missiles disperse evenly over the reservation. Attacking Soviet forces consist entirely of 500 kiloton warheads.[2] The calculations assume a 100 percent Soviet system reliability (unrealistic, but adequate for these calculations), and a probability of kill of .9 per attacking warhead. The Soviet attack consists of 200 warheads with two warheads targeted per garrison.

Soviet warhead requirements are based on the barrage of a 12,000 square mile U.S. mobile ICBM reservation. This assumes that the Soviets launch a sufficient number of warheads to create overpressures of 10 to 30 PSI across the entire reservation. These overpressure blasts destroy or disable the U.S. ICBMs. Maximum overpressure P_0 by a

[1]Most published estimates do not differ greatly from these assumptions and would therefore not greatly affect the following calculations. For additional information on mobile ICBM size, hardness, and deployment options, see Jonathan Rich, "Midgetman: Superhero or Problem Child," *Arms Control Today*, Volume 14, No. 4, May 1984, pp. 1, 6–9 and Blair Stewart, "Technology Impacts on ICBM Modernization: Hard Mobile Launchers and Deep Basing," in Barry R. Schneider, Colin S. Gray, and Keith B. Payne, *Missiles for the Nineties: ICBMs and Strategic Policy*, (Boulder: Westview, 1984), pp. 29–41.

[2]Virtually all Soviet ICBM and SLBM warheads are 500 kiloton. IISS, *The Military Balance*.

warhead of yield Y at distance R is calculated by $P_O= 14.7*(Y/R^3) + 12.8*((Y/R^3)**.5)$. The required number of attacking warheads is judged to be sufficient when the aggregate overpressure area of the attacking warheads surpasses the area of the reservation.

Figure 2 in the text illustrates diminishing marginal returns of attacking Soviet warheads. This reflects the relative ease of destroying small to moderate numbers of U.S. ICBMs and the relative difficulty of destroying remaining ICBMs. Draw down curves representing the number of attacking warheads (A) necessary to destroy a given percentage (P) of mobile ICBMs capable of withstanding overpressures of 10, 20, and 30 PSI are estimated at $A=P^{1.3504}$, $A=P^{1.5033}$, and $A=P^{1.5874}$, respectively.

Exchange calculations concerning the return of mobile ICBMs to main garrisons are essentially identical to the calculations above, but contain additional assumptions. First, the functional relationship between the number of warheads required to destroy mobile ICBMs and the percentage of mobile ICBMs destroyed is linear against mobile ICBMs in garrisons and exponential (i.e., show diminishing marginal returns) against those not in garrison. Second, in the 80% return to garrison case, the data point for the number of warheads required to destroy 90% of ICBMs is estimated. In the 50% and 20% return to garrison cases, the curves beyond the 50% and 20% garrison levels are estimated at $A=P^{1.397}$ and $A=P^{1.355}$, respectively. Third, the total Soviet warhead requirement against any level of dispersed mobile ICBMs does not exceed the warhead requirement when all mobile ICBMs are dispersed.

Finally, calculations regarding the incremental warhead requirement for a Soviet attack on escaping U.S. mobile ICBMs assume 10 mile per hour mobile ICBM dispersal speed and even dispersal from 50 garrisons. Garrisons are assumed to be 1.26 nautical miles in radius. Additional assumptions parallel those listed above.

Strategic Bombers

Calculations concerning the incremental costs of destroying U.S. bombers, measured in the number of attacking warheads, makes several simplifying assumptions. First, U.S. bombers are assumed to be dispersed evenly to 60 main operating and staging bases and 17 MOBs in the dispersed and return to MOB scenarios, respectively. Second, bombers escape at a speed of 300 nautical miles per hour and the average bomber travel time is 6 minutes. (This may understate escape speed, particularly for the B-1B. Also, the average travel time may understate and overstate capabilities in the dispersed and MOB cases, respectively. In the former case, this may underrstate travel time since take-off queues would be minimized. In the latter case, take-off queues may reduce travel

time.) Thus, the barrage requirement area around each base, based on Soviet warhead yield of 500 kilotons, is an area with radius 60 nautical miles. Bombers are assumed to be capable of withstanding overpressures of up to 2 PSI. Overpressure areas created by the attacking warheads are estimated as demonstrated above.

These general assumptions are also used in determining the incremental costs in the number of attacking U.S. warheads on Soviet bombers. However, Soviet bombers are assumed to disperse from 10 to 25 bases. In addition, U.S. attacking warhead yield is assumed to be 100 kilotons.

SECOND STRIKE STRATEGIC BOMBER WARHEADS

These exchange calculations assume that 80% of U.S. bombers are on five-minute alert at 60 main and staging bases and 17 main bases in the dispersed and return to MOBs cases, respectively. U.S. bombers are distributed evenly to all bases. Soviet intelligence is able to locate all bombers at main bases, but is unable to locate 50 percent of those at staging bases. The Soviets target each known airfield with two 500-kiloton warheads. All non-alert aircraft are destroyed. 75% of alerted aircraft are destroyed.

In the U.S. attack on Soviet bombers, 80% of Soviet bombers are on five-minute alert at 25 main and staging bases and 10 MOBs in the dispersed and strategic bomber return to MOBs cases, respectively. This represents an increase from peacetime rates of 10%. Soviet bombers are distributed evenly to all bases. United States intelligence locates all bombers at main bases and 50 percent of those at staging bases. The United States targets each known airfield with two 330-kiloton warheads. All non-alert Soviet aircraft are destroyed. 75 percent of alerted aircraft survive.